HEALTH ASPECTS OF PESTICIDES

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U.S. ENVIRONMENTAL PROTECTION AGENCY

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OFFICE OF PESTICIDE PROGRAMS

TECHNICAL SERVICES DIVISION
4770 Buford Highway, Bldg. 29
Chamblee, Georgia 30341

HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Technical Services Division of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 1150 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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73-1011. Bradford, M. (Author address not given). **Juvenile hormones–a new approach.** *Agr. Merch. 52(2): 39, 41; 1972.*

Some of the more important papers and highlights of the recent Insecticide and Fungicide Conference are reviewed. The need for a "home seed dresser" was illustrated by the fact that dry powders fall off fairly readily while the dosage rate is difficult to control with liquids. A number of experiments yielded information on the proper timing of applications of chloraniformethane, tridemorph, and chlormequat for crops. New uses of various products were presented along with the work done on granular formulations of insecticides such as dimethoate and on ultra low volume applications. The comparative rates of development suggested a lag in the techniques of application. Studies on organothiocyanates used as synergists with insecticides and arylhydrazines used as carbonate synergists and monamine oxidase inhibitors in insects were reported. The most notable development in the area of new controls was the use of a hormone-like mosquito larvicide which is highly selective and apparently non toxic to fish and mammals. Studies to prepare more stable analogs of these juvenile hormones are in progress.

73-1012. Anonymous. **Ruckelshaus promises "fair trial for pesticides."** *Amer. Fruit Grow. 91(11): 10-11; 1972.*

The future of agricultural chemicals was discussed during an interview with William Ruckelshaus, administrator of the U.S. Environmental Protection Agency (EPA). The EPA's goal is to supply the pesticides required by the environment while increasing the benefits and decreasing the hazards. Although not considered an imminent hazard, DDT presented enough long-term risks to warrant suspension of all but a few of its uses. During hearings on DDT, preferential treatment was not given the environmentalists; two thirds of the time was spent listening to proponents of DDT. Increased fee petitions for tolerances have been a result of increased costs incurred and are not meant to eliminate chemical pesticides.

73-1013. Ishikura, H.; Tomizawa, C. (Sci. Technol. Agency, Kasumigaseki, Tokyo, Japan). **[Activities assumed by the international organizations, particularly by FAO and WHO in the regulation of pesticide residues.]** *Bochu Kagaku (Sci. Pest Contr.) 34(1): 27-55; 1969.* (36 references) (Japanese)

The history and development of pesticide residue standardization by the United Nations Food and Agriculture Organization (FAO) and the World Health Organization (WHO) are reviewed. The proceedings of various meetings, recommendations by expert committees, and the decisions made by the conferences are discussed and presented in tables. The tables include recommendations of FAO and WHO committees on acceptable daily intake (ADI) and maximum allowable residues in various food items, the functions and roles of the Codex Alimentarius Commission of FAO/WHO, arsenic residue allowance in grains in various countries, maximum residue amounts of aldrin and dieldrin in milk in various countries, and the final established residue amount of various pesticides in general food items. Recommendations of different countries on specific pesticide residues are discussed.

73-1014. Westing, A. H. (Dept. Biol., Windham Coll., Putney, VT 05346). **Herbicides in war: current status and future doubt.** *Biol. Conserv. 4(5): 322-327; 1972.* (13 references)

Approximately 26 million kg of 2,4-D, 22 million kg of 2,4,5-T, 1.5 million kg of picloram, and 3 million kg of dimethylarsinic acid were used by the U.S. to clear forests and damage crops in South Vietnam between 1961 and 1971. Single applications were made on approximately 15% of the forest area and multiple ones on four percent. Alterations included reduced diversity of plant and animal communities, loss of mineral nutrients, accelerated erosion, and reduced productivity. Flights over affected areas showed almost complete recovery of agricultural areas, but few signs of regeneration in mangrove and forest areas; it is estimated that one decade will be necessary to restore singly-sprayed areas and several decades for the multiply-sprayed areas. Timber losses probably totaled 47 million cubic meters, and rice destroyed would have fed about 894,000 people. Farmers and woodsmen have experienced mild temporary ailments attributed to herbicides. Death and illness of livestock reported by civilians were probably caused by the anti-personnel chemical 'CS' (orthochlorobenzalmalononitrile) or the malathion used in malaria control programs.

73-1015. Quentin, K. E. (Inst. fuer Wasserchemie und Chem. Balneol., Technische Universitaet Muenchen, Munich, Germany). **Pestizide im Wasser–Bestimmung, Entfernung, Grenzwerte. [Pesticides in water–determination, removal, and limiting values.]** *Chem. Ing. Tech. 44(20): 1172-1176; 1972.* (13 references) (German)

Analytical, decontamination, and hygienic problems of pesticide residues in water, especially in that of the drinking supply, are reviewed. The identification and determination of pesticide residues in water are complicated by usually low concentrations and the variety of the possible chemical structures involved. Sampling, extraction, enrichment, preliminary identification of pesticide groups, purification of the extract, and qualitative and quantitative determination are used for water analysis. While organochlorine pesticides are highly persistent in water, other pesticides metabolize into nearly

harmless or even more toxic compounds. The water quality can be monitored by using fish as indicators in ponds connected with the main water body, a method now being standardized, and by cholinesterase inhibition tests when the presence of organophosphorus pesticides and carbamates is suspected. Although the adoption of a reduced maximum allowable pesticide concentration of 50 μg parathion equivalent is being urged in West Germany, maximum allowable concentrations of single pesticides are not valid when several pesticides are present in the water. However, the toxicity of pesticides to aquatic organisms is strongly dependent on the oxygen content in the water. Ozonization is usually ineffective as a decontamination method for pesticide-polluted drinking water.

73-1016. Engst, R. (Author address not given). **Vorkommen und Bedeutung von Fremdstoffen bei der Getreidenahrung. [Occurrence and significance of contaminants in cereals.]** *Ernaehrungsforschung 15(2): 275-285; 1971.* (29 references) (German)

Problems of the contamination of cereals with various pesticides are reviewed. The use of persistent organochlorine pesticides such as DDT in grain production is necessary, especially in developing countries where famine is a major concern. Lindane, once used extensively in grain storage, is being replaced by other pesticides; methoxychlor, though less toxic than lindane, is highly persistent. While the advantages of grain treatment with metathion (fenitrothion) and parathion are doubtful, dichlorvos and ethylene oxide are often used in grain preservation. The highly effective agent against grain pests, methyl bromide, may interfere with enzymes, amino acids, and fatty acids in the human body. The toxicity of promising growth regulators such as chlormequat chloride has not been studied yet.

73-1017. Boerma, A. H. (Food and Agr. Org., United Nations, New York, NY). **Pesticides and the environment: the position of FAO.** *FAO Plant Prot. Bull. 20(3): 45-49; 1972.*

The Food and Agriculture Organization (FAO) of the United Nations recognizes that valuable pest control methods require restriction for environmental reasons but are necessary in developing countries to assist agriculture and ensure employment. The FAO has been trying to minimize possible hazards of control methods while considering production requirements and has advocated ecologically oriented approaches. Regulation of the distribution, marketing, and application of pesticides has been pursued. The organization has collected and evaluated information on residues and effects on wildlife for precautionary measures and supported research on alternatives to organochlorine insecticides.

73-1018. Spynu, Ye. I.; Vrochinskiy, K. K.; Zor'yeva, T. D.; Man'ko, N. N. (All-Union Sci. Res. Inst. Insecticides, Polymers, Plastics Hyg. Toxicol., Kiev, USSR). **Kompleksnoye gigiyenicheskoye normirovaniye novykh fosfororganicheskikh pestitsidov v ob"yektakh vneshney sredy. [Multiple residue tolerances for new organophosphorus pesticides in the environment.]** *Gig. Sanit. 37(11): 96-99; 1972.* (14 references) (Russian)

A procedure for the establishment of multiple residue tolerances for new organophosphorus pesticides in the environment is presented. Standards are set individually for each environmental medium in which the pesticides are likely to occur. Food, water, and air contribute 85, 9, and 6% of the total pesticide intake by man. The acute toxicity of single organophosphorus pesticides, except for carbophos, is generally the same for the oral and inhalation routes. However, the chronic toxicity of organophosphorus pesticides is 100-150% higher in man than in animals. The recommended cidial, phosalone, phencapton, phthalophos, dichlorvos, and menazon residue contents in foods, determined from the maximum no-effect dose for man and from the specific contributions of food, water, and air to the pesticide intake, are 0.1, 0.2, 0.25, 0.3, 0.05, and 1 mg/kg. The corresponding maximum allowable concentrations of cidial, phosalone, phthalophos, and menazon in water are 0.05, 0.001, 0.2, and 0.09 mg/l.

73-1019. Projektgruppe "Ummweltchemikalien und Biozide" (Bundesministerium des Inneren, Bonn, Germany). **Beitrag der Projektgruppe "Umweltchemikalien und Biozide." [Report of the project group on environmental chemicals and biocides.]** *IN: Materialien zum Umweltprogramm der Bundesregierung 1971, Bonn, 1971, pp. 67-107.* (German)

The present situation and future trends in the use of environmental chemicals and biocides in Germany and the objectives of legislation, toxicological, and application studies world-wide are reviewed. The health hazards and residue levels of various pesticides including mercury, cadmium, DDT and related compounds, and PCBs are discussed. Maximum allowable pesticide residue concentrations in the environment will be determined and the use of DDT limited to specific areas. Ecological studies of the pests and the improvement of application techniques are expected to contribute significantly to increased efficiency and restricted use of pesticides, reducing real and potential health hazards.

73-1020. Arbeitsgruppe "Chemische Industrie" (Bundesministerium des Inneren, Bonn, Germany). **Beitrag der Arbeitsgruppe "Chemische Industrie." [Report of the working group on the chemical industry.]** *IN: Materialien zum Umweltprogramm der Bundesregierung 1971, Bonn, 1971, pp. 395-461.* (German)

Toxicity, health hazards, and persistence of the

major groups of pesticides are described during a broad review on chemical industry-generated environmental hazards. The pesticides used recently have considerably lower acute toxicity in warm-blooded animals than preparations used in earlier times. Although the organochlorine pesticides, DDT, aldrin, and dieldrin, have relatively low acute toxicity in warm-blooded animals they are highly persistent and cumulative. Organochlorine aromatic and aliphatic-aromatic compounds are highly persistent; heterocyclic pesticides degrade fairly rapidly; organophosphorus pesticides and carbamates have low persistence and a high acute toxicity. The health hazards of conventional pesticides can be considerably reduced by new, biological pest control methods using attractants, chemosterilants, juvenile hormones, and natural enemies.

73-1021. Ministry of Agriculture and Forestry (Min. of Agr. and Forestry, Tokyo, Japan). **[An official notification concerning the toxicological and residue data which should be submitted when a pesticide applies for registration.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 29: 55-58, 1972.* (Japanese)

The official notification of the Japanese Ministry of Agriculture and Forestry of June 14, 1972, was directed to makers, formulators, and importers of agricultural chemicals other than fertilizers. All new agricultural chemicals requiring registration and others needing renewal of registration must show: toxicological data concerning acute oral, acute s.c. (or i.m.), and acute i.v. toxicity on more than one animal species; chronic oral toxicity on more than one animal species; toxicity to more than two generations on at least one animal species; and residue data for food and soils. The notification also includes methods for preparing the data and gives standards for evaluating the safety of residues of agricultural chemicals. The chronic toxicity data, toxic effects to two or more generations, and the residue data are not required until January, 1973, for a renewal. However, after January, 1973, all the agricultural chemicals requesting registration must submit all data.

73-1022. Charmet, F. (I. N. A. Institut National Agronomique, Paris, France). **La lutte contre la pollution exige-t-elle que l' agriculture soit privee des fongicides organomercuriques? [Does pollution control require that agriculture be deprived of organomercurial fungicides?]** *Phytoma 24(243): 14-18; 1972.* (French)

The environmental effects of organomercurial fungicides used for seed treatment are reviewed. Although organomercurial fungicides have a relatively low acute toxicity, they are chronic poisoning hazards due to their accumulation in tissue, especially in the kidney, liver, and brain. Some harmless mercury compounds present in the environment are transformed into the extremely toxic methyl mercury. The fraction of total mercury used for the production of organomercurial fungicides is 3.8%. Organomercurial fungicides used for seed treatment scarcely affect the natural mercury level of the soil, and crops from treated seeds have mercury levels far below the maximum allowable concentrations, 0.5 ppm in the U.S. Poisonings with organomercurial fungicides are almost exclusively due to the use of contaminated seed material for human or animal consumption.

73-1023. Pons, B. (Min. de l'Agr. et du Developpement Rural, Paris, France). **L'arrete du 2 octobre 1972 relatif a l'utilisation de substances veneneuses. Interdit l'emploi en agriculture des cyclodienes chlores. [Decree of Oct. 2, 1972, on the use of poisonous substances. Prohibition of use of chlorinated cyclodienes in agriculture.]** *Phytoma 24(243): 30; 1972.* (French)

The use of the chlorinated cyclodienes dieldrin, aldrin, heptachlor, and chlordane in agriculture has been prohibited in France by the decree of Oct. 2, 1972. The use of aldrin and heptachlor, granulated and mixed with fertilizer, continues to be permissible for soil treatment for corn, for the treatment of corn, and for that of house plants and flowers.

73-1024. Burrill, J. W. (Author address not given). **The use of fungicides and insecticides in forestry.** *Quart J. Forest. 66(4): 349-352; 1972.*

In forestry, particularly with nurseries and young plantations, the control of fungi is essentially a problem of prevention, but when insect attacks occur, the control is applied after a significant level of attack is reached. Prevention of fungal invasion is achieved by situating the nursery away from known sources of infection, constantly maintaining a clean area, sterilizing the soil, and planting resistant, disease-free species, sprayed preventively. Mature trees are generally resistant to insect attack. Chemicals can safely be used to control attack by a number of insects on young trees if directions are followed and the chemical is handled with care.

73-1025. Boehm, G. T. (Author address not given). **After DDT, what?** *Technol. Rev. 74(8): 26-31; 1972.*

Farmers and consumers will have to learn to tolerate insects and worms. The massive applications of pesticides needed to eradicate pests will not be permitted by a nation concerned with the purity of air, water, and food. The decision to ban nearly all uses of DDT is being tested by court appeals at present. This inexpensive pesticide is relatively safe for animals and man, but is persistent, appears to present long-term environmental hazards, and is also becoming ineffective as resistance to it develops. Other organochlorines have similar drawbacks and will probably be withdrawn from the U.S. market; other kinds of insecticides will be eventually evaluated. A number of drawbacks accompany a ban on the organochlorines: the newer organophosphates and

carbamates are much more toxic, more expensive, and require special handling. Unfortunately, of the 1,250 insect pests in the U.S., only about 100 can yet be partially checked without the use of chemicals. However, a combination of biological and chemical methods has proved successful and economical in a number of instances.

73-1026. Weston, K. E. (Weston Res. Labs. Inc., Purcellville, VA). **Sources and classification of toxicological data: a study of carbaryl.** *Toxicol. Appl. Pharmacol. 22(2): 284; 1972.*

The Toxicology Information Program at the National Library of Medicine was initiated in 1967 as a result of recommendations of the President's Science Advisory committee. The National Academy of Science-National Research Council advisory body for this program, the Toxicology Information Program Committee, has directed its major efforts toward the computerization of validated toxicology information so that it may become available to interested scientists. Beginning efforts were directed toward the toxicity of pesticides. In order to aid this effort a manual file to be used as a module for the gathering of pertinent information was constructed. It was designed with the research toxicologist's needs in mind, but was adaptable to the use of anyone who might need general concepts or detailed fragments. It was also designed so that its organizational plan and condensed abstracts could be used as a guide for a vocabulary of computer systems input when they are available. The pesticide, carbaryl (1-naphthyl-*N*-methyl carbamate), was used as an example. Many aspects of the time, effort, cost, library (and other facilities) services, sources, human skills, and subject matter organization were discussed and illustrated. Suggestions were made for economy of time and the use of more efficient methods of obtaining and recording pertinent information. (Author abstract by permission) (Eleventh Annual Meeting, Society of Toxicology, Williamsburg, March 5-9, 1972. Abstract No. 23)

73-1027. Anonymous. **DDT-Gesetz. [The DDT Law.]** *Z. Lebensm. Unters. Forsch. 150(1): 98-100; 1972.* (1 reference) (German)

The 1972 DDT Law adopted in West Germany is summarized. The production, export, import, sale, purchase, and use of products containing DDT or its isomers as effective agents are prohibited. DDT may be used for research, investigation, experiments, for the synthesis of other products, and the control of *Pediculidae, Monomorium pharaonis*, and *Cimex lectularius* except on humans and other vertebrates and in stables or premises used for the production, handling, and sale of food products. Maximum allowable DDT residue contents in animal food will be established.

73-1028. Ryan, E. W.; Gormley, T. R.; Kavanagh, T. (Kinsealy Res. Cent., Agr. Inst., Dublin 5, Ireland). **Effect of numbers of fungicidal sprays and dates of application on control of celery leaf spot (*Septoria apiicola*) and on chemical residues.** *Ann. Appl. Biol. 72(1): 63-70; 1972.* (15 references)

Of the fungicides tested, organotin compounds gave the best control of celery leaf spot. No tin residues were found in most of the samples from two different centers after four weeks, indicating that the fentin compounds degraded on the plant or were washed off by rain. Two samples of celery sprayed with one of the fentin acetate (FA) and maneb formulations had 0.4 and 0.3 ppm FA residues. The nonlinear relationship between optical density and tin in the assay procedure was not previously reported. Transmittance was proportional to the tin concentration.

73-1029. Kempton, R. J.; Maw, G. A. (Glasshouse Crops Res. Inst., Littlehampton, Sussex, England). **Soil fumigation with methyl bromide: bromide accumulation by lettuce plants.** *Ann. Appl. Biol. 72(1): 71-79; 1972.* (9 references)

A significant incorporation of water-extractable bromide into lettuce plants grown on methyl bromide-treated plots as compared with that in plants from untreated plots was observed, particularly at high rates of application (1-2 lb/100 ft^2). At 1 lb/100 ft^2 and 24 weeks after fumigation, the mean inorganic bromide in the soil was 95μg/g and the mean bromide in 18-wk old lettuce was 2.3 mg/g. Similar results were obtained with commercial treatment of lettuce plots. Pot-grown lettuce exposed to various concentrations of potassium bromide also accumulated the bromide in the tissue, primarily in the outer leaves. No stunting or leaf damage resulted from exposure to soil treated at 5 mg/g. Bromide concentrations in lettuce grown in methyl bromide-treated soils can be as high as 0.6 mg/g on a fresh weight basis, 0.3 mg/g being the expected value with current fumigation procedures.

73-1030. Bowmer, K. H. (C.S.I.R.O., Div. Irrigation Res., Griffith, New South Wales, Australia). **Measurement of residues of diuron and simazine in an orchard soil.** *Aust. J. Exp. Agr. Anim. Husb. 12(58): 535-539; 1972.* (15 references)

Simazine and diuron were applied at one, two, and three times the recommended levels in apple orchards each spring in 1965-1970. Residues of both compounds were estimated by bioassay; simazine was also analyzed by alkali flame detector GC in order to determine the usefulness of this technique. In the latter technique, a linear response to simazine and the internal standard, atrazine, was obtained using GLC with an alkali flame detector and a column packed with 3% cyclohexane dimethanol succinate on AW-DMCS treated chromosorb W. The material was initially extracted from the soil with acetone and partially purified with a methylene chloride extraction. The results indicated that diuron traveled to a depth of 40 cm while simazine was confined to the top 15 cm. Diuron persisted longer than predicted, having a mean residue in July of 2.4 kg/ha at the recommended dosage; mild damage to trees appeared after six years of applying the same dosage. Simazine residues were relatively small, 0.11 kg/ha in July at the recommended dosage, and had no deleterious effect on the trees when applied for six years at three times the recommended dosage.

73-1031. Koeman, J. H.; Hadderingh, R. H.; Bijleveld, M. F. I. J. (Inst. Vet. Pharmacol. Toxicol., Univ. Utrecht, Biltstraat 172, Utrecht, The Netherlands). **Persistent pollutants in the white-tailed eagle in the Federal Republic of Germany.** *Biol. Conserv. 4(5): 373-377; 1972.* (19 references)

DDE, polychlorinated biphenyls (PCBs), mercury, hexachlorobenzene, dieldrin, and heptachlor epoxide were detected in the eggs of white-tailed eagles, one adult eagle, and two sparrow hawks collected in Schleswig Holstein, Germany. Residues of all but dieldrin were generally found in coot, pike, and great-crested grebe from the same area. Residues of DDE and PCBs ranged from 1.2 to 17 ppm and 6.1 to 97 ppm, respectively, in eagle eggs although PCBs have not been definitely correlated with low reproductive success. The results suggest that DDE is the main factor responsible for reproductive failure among white-tailed eagles in Schleswig Holstein. The literature contains a number of studies which implicate DDE with embryo mortality, apparently responsible for the decline of the eagles. Residues of DDE in most of the eggs approximated those found in bald eagles where nesting success has been poor.

73-1032. Nakahara, T.; Takase, I.; Kawagoe, I.; Kubota, T.; Saito, T. (Agr. Chem. Inst., Nihon Tokushu Noyaku Seizo Co., Ltd., Hino, Tokyo, Japan). **[On the residue of trichlorfon and its metabolites in fresh milk.]** *Bochu Kagaku (Sci. Pest Contr.) 37(4): 149-154; 1972.* (4 references) (Japanese)

Residues of trichlorfon and its metabolites were determined in milk from cows dosed by several routes of administration with trichlorfon. Gas chromatography with flame thermionic detector and electron capture detector were used. Twenty-four hours after administering 3 mg of trichlorfon/kg intragastrically, 0.007 ppm of residual trichlorfon was detected; after 72 hours the residue decreased to less than 0.001 ppm, the limit of detection. Three hours after administering 3 mg of trichlorfon/kg mixed with the diet, a maximum residue of 0.091 ppm appeared in the milk and decreased to 0.003 ppm after 24 hrs and less than 0.001 ppm after 72 hours. Until nine hours after administering 30 mg trichlorfon/kg mixed with the diet, about 0.2 ppm

(maximum 0.55 ppm) of trichlorfon remained in the milk and decreased rapidly to 0.007 ppm after 24 hours. The metabolites of trichlorfon, including dichlorvos, trichloroethanol, and dimethylphosphate, were not found in the milk of cows given trichlorfon orally or intragastrically at the dose level of 3 mg/kg. At a level of 30 mg/kg a small amount of dichlorvos and traces of trichloroethanol and dimethylphosphate were detected in the milk taken one hour after administration. These degraded more rapidly than trichlorfon, no metabolite being detected after nine hours. After five consecutive days of administering trichlorfon at a dose of 1 mg trichlorfon/kg/day, 0.03 ppm of trichlorfon was found in the milk taken one hour after the last dose; 0.009 ppm remained in the milk after 24 hours. The degradation rate of the residue of trichlorfon in milk seems somewhat slower after continuous doses than after single doses.

73-1033. Lee, Y. W.; Ford, R. J.; McDonald, H.; McKinlay, K. S.; Putnam, L. G.; Saha, J. G. (Res. Sta., Canada Agr., Saskatoon, Saskatchewan, Canada). **Residues of methomyl in rape plant and seed following its applications for the control of bertha armyworm, *Mamestra configurata* (*Lepidoptera: Noctuidae*).** *Can. Entomol. 104(11): 1745-1750; 1972.*

Residues of methomyl in rape plant and seed were determined following hasty application for control of the bertha armyworm in the Canadian prairie provinces. A GC method of analysis was developed which eliminated interfering sulfur-containing compounds found in those samples. After one application of methomyl at 3 oz/acre, a 17 ppm residue in the plant declined to 1.5, 1.0, 0.4, and 0.2 ppm in 1, 2, 5, and 9 days, respectively; seed harvested 22 days after application contained no detectable residues. An 8-fold difference in residues was observed immediately after spraying on different farms, indicating inefficient application in some cases. Rape seed samples taken 17 to 45 days after spraying contained no detectable residue in 33 cases and 0.02 to 0.03 ppm in three cases. Methomyl application at 3 to 4 oz/acre is expected to leave little or no residue in rape seed oil.

73-1034. Ferrari, A. (Clin. Med. Vet., Parma, Italy). **I residui dei pesticidi nelle carni degli animali. [Pesticide residues occurring in animal meats.]** *Clin. Vet. 95(5): 143-152; 1972.* (Italian)

A brief review discussing organochlorine, organophosphate, and carbamate residues in meat, fat, eggs, and plant oils is presented. Data included is on organochlorines such as BHC and derivatives, lindane, heptachlor, aldrin, dieldrin, and DDT and its metabolites and deals in terms of metabolic and excretion rates in livestock, small animals, and poultry, covering the French, Italian, English, and U.S. literature. Organophosphates including Ruelene (crufomate), trichlorfon, fenthion, fenchlorphos (ronnel), dichlorvos, diazinon, and coumaphos, are discussed along with synthetic carbamates such as carbaryl or dithiocarbamates. The maximum allowable residue limits established by individual European countries at the European Common Market level and in the U.S. are also given.

73-1035. Werner, H. (Staatliches Inst. fuer Milchwirtschaftliche Forsch., Hillerod, Denmark). **Pestizidrueckstaende in daenischen tierischen Lebensmitteln. [Pesticide residues in foods of animal origin in Denmark.]** *Deut. Lebensm. Rundsch. 69(1): 35-39; 1972.* (5 references) (German)

Results of organochlorine pesticide residue determinations in foods from animals in Denmark are reviewed. Residues of organochlorine pesticides in food are primarily due to imported contaminated fodder since all organochlorine pesticides except lindane have been banned in Denmark for years. The DDT contents in butter remain below 0.1 ppm; α-BHC, dieldrin, and lindane concentrations are far below 0.05 ppm and appear to be decreasing. Although DDT contents in eggs are comparable to those in dairy products, the dieldrin, lindane, and α-BHC levels are much lower in dairy products. Only organochlorines were found in meat. Salt-water fish investigated contained 0.03-0.51 ppm of DDT with a maximum of 2.03 ppm. Fish from the North Sea contained only traces of PCBs.

73-1036. Terplan, G. (Veterinaerstr. 13, 8 Munich 22, Germany). **Rueckstaende von Arznei- und Pflanzenschutzmitteln sowie mikrobiellen Stoffwechselprodukten in Milch und Milcherzeugnissen. [Residues of drugs and plant-protective agents and microbiological metabolic products in milk and milk products.]** *Deut. Tieraerztl. Wochenschr. 79(7): 150-152; 1972.* (German)

The general problems and implications of pesticide, drug, and antibiotic residues in milk and dairy products are reviewed. Milk produced in Germany contains residues of at least two pesticides and often more, sometimes at levels fairly close to the established maximum allowable residue concentrations. However, human milk contains pesticide residues 10 times greater than cows' milk. No damages to health due to the prolonged intake of pesticide residues in milk and other food products have been evidenced as yet.

73-1037. Reichenbach-Klinke, H. H. (Zool.-Parasitol. Inst., Univ. Muenchen, Munich, Germany). **Der Fisch als Spiegel der Umwelt. [Fish as a mirror of the environment.]** *Deut. Tieraerztl. Wochenschr. 79(7): 159-160; 1972.* (4 references) (German)

The general problem of the contamination of water bodies with heavy metals, detergents, phenols, and pesticides, which fish can indicate, is reviewed. Fish, especially rapacious species, accumulate residues in their

bodies several times greater than the residue concentration in the water they inhabit. A toxaphene residue level of 4 ppb, reflecting a cumulation factor of up to 4,000, was measured in fish. The pesticide residue concentration in the fish body increased to 8,500 times that of the water over 120 days during an experiment. Mercury concentrations several times greater than the maximum allowable level of 0.5 or 1 ppm were often determined in fish caught in Sweden, Finland, Canada, and the U.S. Histopathological investigations showed enlargement of lipoid cavities in nervous cells indicative of some insecticide poisonings in fish.

73-1038. Abron, L. A. (Univ. of Iowa, Iowa City, IA). **A transport mechanism in hollow nylon fiber reverse osmosis membranes for the removal of DDT and aldrin from water.** *Diss. Abstr. Int. 32(12): 7000B; 1972.*

The use of hollow nylon fiber reverse osmosis membranes for removal of DDT and aldrin from aqueous solutions was investigated. The membranes rejected 80-85% of the hardness-producing ions in brackish and hard waters; these ions were classified as membrane non-interacting solutes. The total of DDT recovered in both the permeate and reject streams was no more than 30% of the input quantity, and for aldrin, no more than 40%. DDT and aldrin were still present in the permeate and reject streams during the distilled-water rinse phase, and classified as membrane-interacting solutes. After exposure to pesticides, the membranes were reexamined. There was a slight decrease in the flux rate and in the rejection quotient for inorganic solutes. The transport of the non-interacting solutes was due to pore flow while the transport of membrane-interacting solutes was probably diffusive. Since the pesticides were strongly sorbed on the membrane and would be largely retained even after prolonged rinsing, the only application of nylon fiber membranes for removal of DDT and aldrin residues from water would be in the form of an adsorbent. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-17,530)

73-1039. Ercegovich, C. D.; Hartwig, N. L.; Witkonton, S.; Carroll, P. (Dept. Entomol. and the Pestic. Res. Lab., Pennsylvania State Univ., University Park, PA 16802). **Persistence of 5,6-dichloro-2-trifluoromethylbenzimidazole, a major degradation product of fenazaflor, in Hagerstown silt loam soil.** *Environ. Entomol. 1(6): 730-734; 1972.* (8 references)

Results of analyses of Hagerstown silt loam soil treated with different amounts of Lovozal (fenazaflor) indicate that no significant disappearance of 5,6-dichloro-2-trifluoro-methylbenzimidazole (NC 2983), a major degradation product, takes place in fall, winter, and early spring under Pennsylvania climate conditions. Decreasing residues of this product were observed in late spring. In summer, the time when fenazaflor would normally be applied, just over 50% of the product disappeared within 84 days. In 131 days only 17 to 20% corresponding to the amount applied remained in the soil. No significant amounts of NC-2983 were recovered at a depth from 6 to 12 inches, suggesting that downward movement was not responsible for the losses. NC 2983 disappeared at a faster rate when the same amount of fenazaflor was applied in split applications; an enrichment of the soil with microorganisms capable of degrading the product may occur. No NC 2983 was detected in peel-free portions of treated potatoes; trace amounts were found in peel-free parts of carrots. Peels of both crops contained trace residues, especially with the highest rate of application.

73-1040. Dorough, H. W.; Gibson, J. R. (Dept. Entomol., Univ. Kentucky, Lexington, KY 40506). **Chlorinated insecticide residues in cigarettes purchased 1970-1972.** *Environ. Entomol. 1(6): 739-743; 1972.* (8 references)

Cigarettes purchased over a three year period were analyzed by GC for chlorinated insecticides. SE-30:QF-1 and OV-210 columns were used; the former gave better separation of DDT derivatives and the latter was most satisfactory for resolving all of the insecticides in question. Residues of total DDT were 36, 44, and 27 ppm in 1970, 1971, and 1972, respectively, and variation between brands was not significant. Relative concentrations of specific DDT-TDE isomers were similar to those reported in previous years. About 53% of the total DDT residues was TDE. Endrin and dieldrin were not detectable in the cigarettes analyzed. Although not detected in 1970 and 1971, endosulfan concentrations in 1972 averaged 0.4 ppm with 0.3 as the sulfate, 0.1 ppm as endosulfan II, and trace amounts of endosulfan I.

73-1041. Kennedy, D. S. (Res. Div., Rohm and Haas Co., Philadelphia, PA 19137). **Treatment of effluent from manufacture of chlorinated pesticides with a synthetic, polymeric adsorbent, Amberlite XAD-4.** *Environ. Sci. Technol. 7(2): 138-141; 1973.* (4 references)

A new process is described for treating chlorinated pesticide waste effluents. Pesticides are adsorbed on Amberlite XAD-4, a newly developed synthetic, polymeric adsorbent possessing high porosity (50 vol %), high surface area (850 m^2/g) and an inert, hydrophobic surface. The adsorbent is regenerated with an organic solvent, and the adsorbed pesticides are recovered in a concentrated form. Laboratory studies are reported in which XAD-4 and a commercial, granular activated carbon were compared for treating the effluent from a pesticide manufacturing operation. The leakage of unadsorbed pesticides from the XAD-4 column was significantly lower than that from the activated carbon

column. The adsorbed pesticides were efficiently desorbed from XAD-4 by eluting with isopropanol. The activated carbon could not be regenerated effectively with isopropanol. An estimate of capital and operating expenses for a full-scale facility is presented. This projection indicates that pesticide waste treatment via XAD-4 and chemical regeneration will be more economical than granular activated carbon employing external thermal regeneration. (Author abstract reprinted by permission of the American Chemical Society)

73-1042. Cwiertniewska, E. (Inst. for Study of Food Products, Nat. Inst. of Hyg., Warsaw, Poland). **Obecnosc insektycydow chloroorganicznych w mleku kobiecym. [Presence of chloroorganic insecticides in human milk.]** *Farm. Pol. 28(5): 507-509; 1972.* (9 references) (Polish)

A brief review of information on the content of DDT, DDE, BHC, and dieldrin in human milk reported by investigators in different countries is presented. The following amounts of DDT+DDE (in mg/kg) are quoted: U.S., 0.0-0.77; England, 0.075-0.17; Hungary, 0.13-0.26; USSR, 1.22-4.88; Italy, 0.050; Poland, 0.27-0.40. Some studies indicate that BHC in human milk is present mainly in the form of its β-isomer, characterized by a high chronic toxicity. The dangers of insecticide residue accumulation in human tissues are briefly discussed.

73-1043. Mirna, A. (Inst. fuer Chemie und Physik, Bundesanstalt fuer Fleischforsch., Kulmbach, Germany). **Zum Problem umweltbedingter Rueckstaende in Fleisch. [The problem of environmentally determined residues in meat.]** *Fleischwirtschaft 52(3): 321-324, 327; 1972.* (59 references) (German)

The problem of lead, mercury, pesticide, and nitrogen oxide residues in meat is reviewed. A maximum allowable mercury concentration of 50μg/kg in food is recommended by the World Health Organization. Poisonings with symptoms similar to those of Minamata disease were reported from Sweden, Finland, the U.S., and other American countries. The very stable organochlorine compounds accumulate in adipose tissues. The DDT level in human fat is related to meat consumption. Adipose tissues of vegetarians contain 50-75% less DDT than the tissues of the population as a whole. One year was required for establishment of equilibrium between DDT retention and elimination in volunteer subjects fed 3.5-35 mg of DDT daily. The respective contributions by meat and milk products to the DDT content in the human body are about 50% and 20%. Conversion of DDT and DDE into DDD (TDE) in boiled and broiled chicken was observed. The respective allowable daily intake values recommended by the World Health Organization for aldrin, total DDT, dieldrin, heptachlor, and BHC are 0.0001, 0.0050, 0.0001, 0.0005, and 0.0006 mg/kg body weight.

73-1044. Ristow, R.; Koesters, J. (Inst. fuer Tieraerztl. Nahrungsmittelkunde, Giessen, Germany). **Rueckstandsanalytische Untersuchungen nach Einsatz eines insektiziden chlorierten Kohlenwasserstoffes zur Entwesung eines Gefluegelstalles mit Bodenheizung. [Residue analysis experiments after using an insecticidal chlorinated hydrocarbon to disinfect a poultry house with floor heating.]** *Fleischwirtschaft 52(6): 755-760; 1972.* (15 references) (German)

Residues of Bromocyclen used as spray for the preliminary disinfection of poultry houses were determined by gas and thin-layer chromatography in sand, straw, litter, and feed and in the abdominal fat and meat of chickens. The residue contents in sand, straw, litter, and feed samples were 1.56-58.4 ppm, 7.55 ppm, 1.85 ppm, and 0.013-0.080 ppm. The residue levels in the abdominal fat and the whole meat of fattened chickens were 0.093-0.249 ppm and 0.0134-0.0286 ppm; a metabolite (0.109-0.247 ppm in abdominal fat and 0.0147-0.249 ppm in whole meat) was detected, but not identified. Pesticide residues present in chickens immediately after transfer into a previously treated poultry house rose sharply during the first third of the fattening period and then dropped to about one fourth the initial level; the metabolite content rose to 30 times the initial content. The total pesticide content in slaughtered poultry ranged from 0.01 to 0.02 ppm.

73-1045. Krasyuk, N. N.; Zhulenko, V. N.; Stavitskiy, R. V. (Moscow Technol. Inst. Meat Dairy Production, Moscow, USSR). **K voprosu o migratsii rtuti, soderzhashcheysya v nekotorykh pestitsidakh, v biologicheskikh tsepyakh. [The problem of migration of mercury contained in certain pesticides in biological chains.]** *Gig. Sanit. 37(11): 51-54; 1972.* (Russian)

Mercury contents in 570 tissue and organ samples from 2-3, 5-6, and over 10 years-old cattle were determined by neutron irradiation technique. The samples were obtained from cattle slaughtered on farms in the Lipetsk and Moscow areas where a variety of mercurial compounds had been used as seed dressings for ten years or more. The mercury concentrations, increasing with age, were highest in the liver (1.05-4.185 mg/kg), kidney (0.671-4.558 mg/kg), cerebrum (0.0723-1.47 mg/kg), skeletal muscles (0.0733-1.3096 mg/kg), and in the gastric wall (0.086-0.276 mg/kg). The lung contained 0.0074 to 0.0566 mg of mercury per kg and mercury was detected in all the rest of the organs and tissues as well. The data confirms the health hazards involved in the agricultural use of organic mercury compounds.

73-1046. Saito, M.; Kitayama, M.; Mori, M.; Tsuzuki, T.; Kitsutaka, T. (Hokkaido Inst. of Pub. Health, Sapporo, Japan). **[Studies on prevention of poisoning by agricultural chemicals (Part 14). Water pollution by sodium chlorate strewn on forest regions from helicopter.]** *Hokkaidoritsu Eisei Kenkyusho-ho (Rep.*

Hokkaido Inst. Pub. Health) 20: 123-129; 1970. (8 references) (Japanese)

Pollution of water by herbicides was investigated in three locations in Hokkaido where 50% sodium chlorate was sprayed aerially. The sodium chlorate residue was determined by colorimetry using *o*-tolidine on 10 ml of the test material at 444 mμ. The samples taken closest to spraying (70-380 m) showed sodium chlorate residues 2 to 4 hours after spraying; the maximum was reached within 3 to 10 hours in the amount of 3.5 to 49.8 ppm. Five samples taken more than 3580 m distance from the spraying had no traces of sodium chlorate; no residues were detected in river water after 15 days. The lethal dose of sodium chlorate for man is 15 to 30 g, and severe poisoning symptoms occur at 4 to 10 g; the lethal dose for dogs is 1.2 to 2.8 g/kg, and for rabbits 8 to 12 g/rabbit. The dose ranges from 870 ppm to 5,700 ppm for fish. It was concluded that the maximum amount of 49.8 ppm detected in this investigation would not harm fish, cattle, or humans and sodium chlorate sprayed aerially would not cause harmful pollution of river or spring water. However, it is desirable to avoid drinking the water for at least 15 days within a 1 km radius of the spraying and for at least 24 hours up to a 2 km radius.

73-1047. Saito, M.; Kitayama, M.; Kitsutaka, T. (Hokkaido Inst. of Public Health, Sapporo, Japan) **[Studies on the prevention of poisoning by agricultural chemicals (Part 15). BHC and DDT residues in water and soil.]** *Hokkaidoritsu Eisei Kenkyusho-ho (Rep. Hokkaido Inst. Pub. Health) 22: 83-85; 1972.* (Japanese)

Forty samples from three rivers of Hokkaido, 12 samples from rice paddies, and 30 samples from dry fields were gathered in 18 districts of Hokkaido and analyzed for BHC and DDT by gas chromatography. Almost no residues were detected in the river water samples, but high residues of BHC in the rice paddy samples and of DDT in the dry field samples were found. The maximum γ-BHC (lindane) residue in rice fields was 3.654 ppm, the average 1.656 ppm; the maximum β-BHC 0.964 ppm, the average 0.658 ppm. In the dry fields the maximum γ-BHC was 0.307 ppm, average 0.050 ppm and the maximum β-BHC 0.394 ppm, the average 0.076 ppm. *p,p'*-DDT residues in the dry field ranged from 0. to 1.271 ppm, with an average of 0.301 ppm. All residue counts were measured from air-dried soil. The rate of the volume reduction of the rice field soil samples was 23 to 45%, and that of the dry field samples was 9 to 28.6%.

73-1048. Saito, M.; Kitayama, M.; Kitsutaka, T. (Hokkaido Inst. of Pub. Health, Sapporo, Japan). **[Studies on the prevention of poisoning by agricultural chemicals (Part 16). Water pollution by sodium chlorate strewn on forest regions from helicopter (2).]** *Hokkaidoritsu Eisei Kenkyusho-ho (Rep. Hokkaido Inst. Pub. Health) 22: 86-91; 1972.* (Japanese)

Sodium chlorate (50% particles) is sprayed by helicopter over the forests of Hokkaido. Investigations of spring water, pond water, and river water were conducted in the areas where 150 to 250 kg/ha herbicide was sprayed aerially. In one area samples were taken before and after the spray, up to one month. In four areas, 2270 to 3690 kg of sodium chlorate was sprayed. Of the total 40 locations where samples were taken, 25 locations showed no trace of sodium chlorate. *o*-Tolidine colorimetry was used for determination. The maximum residues (0.3-49.6 ppm) were detected on the day of spraying. In flowing waters the concentration of sodium chlorate decreased to 0-3.5 ppm 24 hours after spraying, 0-14 ppm two days after, and 0 to 0.9 ppm 10 days after. There was no trace of residue in any of the samples 20 days after spraying. The highest residues (49.6 ppm) were detected in a spring near the spray area three hours afterwards.

73-1049. Saito, M.; Kitayama, M. (Hokkaido Inst. of Pub. Health, Sapporo, Japan). **[Studies on the prevention of poisoning by agricultural chemicals (Part 17). Water pollution by rodenticide (thallium sulfate) strewn on forest region from helicopter.]** *Hokkaidoritsu Eisei Kenkyusho-ho (Rep. Hokkaido Inst. Pub. Health) 22: 92-95; 1972.* (Japanese)

Thallium sulfate is sprayed over the forests of Hokkaido in the fall to kill rats and other rodents. The possibility of water pollution by aerial spray was investigated in the Hakodate area where 0.8 kg/ha and 0.4 kg/ha of 0.6% particle thallium sulfate was sprayed over two forests in amounts of 120.0 kg in one area and 46.5 kg in the other. At the latter locations, 46.5 kg of zinc phosphate was also sprayed. Investigations were conducted for one month throughout the two river basins, before and after the spraying. Samples were taken at the locations of spraying and at distances of 50, 150, 200, 240, 480, 1950, and 3950 m. No trace of any thallium sulfate nor zinc phosphate was found at any location at any time.

73-1050. Grib, N. V.; Kovban, V. Z.; Burtsev, A. L. (Roven Regional Vet. Res. Station, State Hydrol. Inspection Station, Poles'ye, Roven, USSR). **Vliyaniye obrabotki malykh rek Zapadnogo Poles'ya insektitsidami (pri bor'be s gnusom) na ikh gidrobiologicheskiy rezhim. [The hydrobiology of creeks in western Poles'ya as affected by the introduction of insecticides for the control of Simuliidae.]** *Gidrobiol. Zh. (Kiev) 8(1): 98-101; 1972.* (10 references) (Russian)

The effects of DDT, introduced into a creek at a rate of 0.2 g/m^3 water over a 30 min period, were studied. A larvicidal concentration for midges was maintained for 3 hr after which the concentration fell to 0.1 mg/l. in 20 hr. The DDT concentration 8 km from the point of introduction was 0.18 mg/l. after 3 hr. The

benthic layer contained 0.125-0.175 mg of TDE plus DDE per kg, while the respective metabolite concentrations at 1 and 8 km from the application site were 2.8 and 2.2 mg/kg. Death of infusoria and arthropods and proliferation of diatoms were observed. A substantial reduction in the alkalinity of the water and the calcium ion concentration as well as an increase in the magnesium ion concentration were determined. DDT concentrations above 0.2 mg/l. caused a considerable decrease in the BOD5 while concentrations below 0.2 mg/l. had the opposite effect.

73-1051. Adachi, K. (Hyogo Prefect. Hyg. Lab., Kobe, Japan). **[Studies on pesticide residues. Residues in rice field soil and straw.]** *Hyogo-Ken Eisei Kenkyusho Kenkyu Hokoku (Bull. Hyogo Prefect. Pub. Health Lab.) 7: 47-48; 1972.* (1 reference) (Japanese)

The fluctuation of organochlorine pesticide residues in the soil and straw from rice fields was investigated. Samples were taken from straw used for cattle feed at dairy farms and soil from the same farms in Mihara county. The total BHC residue in soil averaged 0.329 ppm in 1970 and 0.099 ppm in 1972, with maxima of 0.734 and 0.146 ppm; total DDT residue increased from 0.257 to 0.334. BHC residues in straw averaged 0.679 ppm in 1970 and 0.118 in 1971 with a maximum of 1.928 and 0.328 ppm respectively for the two years. Total DDT averaged 0.078 and 0.014 ppm; the maximum was 0.799 and 0.026. In one year the total BHC residue decreased 30% in the soil and 18% in the straw; total DDT decreased 63% from the soil and 18% from the straw.

73-1052. Ivey, M. C.; Mann, H. D.; Oehler, D. D.; Claborn, H. V.; Eschle, J. L.; Hogan, B. F. (Entomol. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Kerrville, TX 78028). **Chlorpyrifos and its oxygen analogue: residues in the body tissues of dipped cattle.** *J. Econ. Entomol. 65(6): 1647-1649; 1972.* (3 references)

Residues of chlorpyrifos and its oxygen analog (diethyl 3,5,6-trichloro-2-pyridyl phosphate) present in the body tissues of cattle and the rate of elimination were determined after multiple dippings in 0.025% emulsion of chlorpyrifos. The residues of chlorpyrifos were preponderantly in the fatty tissues, and the low residues found in other tissues could be attributed to the small amount of fat present. The highest residues in fat occurred one week after the 2nd and 3rd dippings. No oxygen analogue was detected in any of the tissues. (Author abstract by permission)

73-1053. Miller, L. L.; Narang, R. S.; Nordblom, G. D. (Dept. Chem., Colorado State Univ., Fort. Collins, CO 80521). **Sensitized photolyses of DDT and decyl bromide.** *J. Org. Chem. 38(2): 340-346; 1973.*

Photolyses of DDT at 310 nm under nitrogen yielded TDE and HCl; the reaction was slowed by the addition of hexyl mercaptan and quenched by oxygen. An 8-hr irradiation of DDT and diethylaniline in methanol produced TDE; DDE; DDCO; diethylaniline hydrochloride; methyl 1,1-bis (*p*-chlorophenyl) acetate; *cis*- and *trans*-1,1,4,4-tetrakis(*p*-chlorophenyl)-2,3-dichloro-2-butene, *α,α*-bis(*p*-chlorophenyl)-*p*- diethylaminoacetophenone; 1,1-bis(*p*-chlorophenyl)-2-(*p*-diethylaminophenyl)-2-methoxyethylene; and 1,1-bis(*p*-chlorophenyl)-2,2- bis(*p*-diethylaminophenyl)ethylene. TDE and DDE were also decomposed under the reaction conditions. All three of these reactions proceeded in the presence of oxygen and may be useful in effecting the degradation of DDT in the environment. Tests of other compounds in degassed ethanol or cyclohexane indicated that triplet sensitizers with ET $\geqslant$ 59 kcal/mol effectively sensitize the decomposition of DDT to TDE while those with ET $\leqslant$ 53 kcal/mol do not. Studies on the photolysis of decyl bromide were conducted to elucidate the mechanism of these reactions. The excited singlet state of diethylaniline was suggested as the first reactive intermediate.

73-1054. Kato, K.; Yamada, T.; Watanabe, S.; Wada, Y.; Fukuda, M.; Kuroda, M.; Nakaoka, S.; Takahashi, T.; Miyashiro, K.; Masuda, J.; Yasukata, S. (Kanagawa Prefect. Inst. of Public Health, Yokohama, Japan). **[Analyses of residual pesticides in vegetables, cows' milk, and mothers' milk.]** *Kanagawa-ken Eisei Kenkyusho Nenpo (Annu. Rep. Kanagawa Prefect. Inst. Pub. Health) 21: 85-92; 1971.* (Japanese)

Pesticide residues in vegetables and cows' milk and in the milk of mothers residing in Kanagawa Prefecture were analyzed. No trace of DDT, parathion, or EPN was detected in cows' milk, 11 vegetables, and six fruits produced in the prefecture or dairy products purchased at local markets. Gamma-BHC (lindane) was detected in 25% of the samples in amounts ranging from 0.001 to 0.023 ppm, and dieldrin was found in one cucumber sample at 0.012 ppm. The average total BHC residue in market milk over the year was 0.017 ppm, and in fresh milk, 0.019 ppm; both averages were lower than the total average for Japan, 0.034 ppm. Breast milk samples were taken from 59 mothers between 20 and 48 years old within five months of delivery. BHC, DDT, and dieldrin residues ranged between 0.018-0.74 ppm, 0.019-0.105 ppm, and 0-0.012 ppm, respectively.

73-1055. Heinisch, E.; Beitz, H.; Seefeld, F.; Hartisch, J.; Dunsing, M.; Reifenstein, H. (Inst. fuer Pflanzenschutzforsch. Kleinmachnow, Biol. Zentralanstalt Berlin, Deut. Akad. der Landwirtschaftsw. zu Berlin, DDR). **Pflanzenschutzmittelrueckstaende an pflanzlichem Erntegut nach nicht beabsichtigten Mitbehandlungen. [Residues of crop protectives on the harvested crop after unintentional treatment.]** *Nachrichtenbl. Pflanzen-*

schutzdienst DDR 25(7): 141-146; 1971. (35 references) (German)

Pesticide residues may occur in untreated crops due to uptake from previously contaminated soil, dropping of pesticides from fruit trees, or drift of aerially sprayed chemicals. Organochlorines such as DDT and its isomers, dicofol, lindane, and toxaphene are persistent in soil and can be taken up by subsequent crops for prolonged periods. The triazines are the most persistent herbicides, but amine metabolites of carbamate and urea-derived herbicides may also translocate in plants. Mercurial and PCNB fungicides are also persistent and capable of absorption and translocation. With increasing mechanization of agriculture, the planting of secondary crops beneath fruit trees in orchards will decrease and the problem of pesticide uptake by such crops be alleviated. Residues in crops adjacent to pesticide-treated fields generally decrease in proportion to the distance from the treated area. To prevent excessive residue levels, crops within 100 m of fields sprayed with DDT or toxaphene should not be harvested within less than 42 days after treatment. Fields treated with organochlorines or other persistent pesticides should not be used for growing medicinal plants or crops used in baby food within two years after treatment.

73-1056. Gruebner, P. (Pflanzenschutzamt, Dresden, DDR). **Rueckstandsprobleme bei der Anwendung von Phosphorsaeureester-Insektiziden im Champignonanbau. [Residue problems in connection with the application of phosphoric acid ester insecticides in mushroom production.]** *Nachrichtenbl. Pflanzenschutzdienst DDR 26(12): 245-247; 1972.* (12 references) (German)

Dichlorvos, Tinox-50 (demephion), and Bi 58 EC (dimethoate) residues in mushroom and cucumber grown subsequently in the same location were determined by semiquantitative thin-layer chromatography. The dichlorvos residues in mushroom fell to below 0.2 ppm one day after spray or vapor application up to a concentration of 40 ml per 100 m^2. A waiting period of one day after application is recommended although small amounts of residues were detectable over six days; the dichlorvos concentration in the air fell to below 0.2 mg/m^2 about eight hours after application. Watering or spraying with dimethoate or demephion in greenhouses where mushroom production is followed by cucumber growing is not recommended. If the last mushroom harvesting takes place after cucumber planting, the joint treatment results in high residue concentrations in mushroom. The reduction of the dimethoate and demephion residues to below the tolerance limit in mushroom requires one to two weeks.

73-1057. Hayashi, M. (National Inst. of Pub. Health, Tokyo, Japan). **[Pesticide pollution of mother's milk.]** *Nippon Ishikai Zasshi (J. Jap. Med. Ass.) 68(12): 1281-1286; 1972.* (Japanese)

The Ministry of Health and Welfare analyzed human breast milk for pesticide residues between January and March 1971 with the cooperation of 24 prefectures. Samples were taken from 214 mothers from farming families and 241 mothers from non-farming families. Milk analyses, pesticide contact history, general health of mothers and babies, and liver function of the mothers were recorded. The incidences of detection of both BHC and DDT were 100%, and dieldrin, 79%. The β-BHC content in the farm mothers averaged 0.0926, and in the non-farm mothers 0.1434 ppm, with a maximum of 1.158 ppm. The total DDT in the milk of the farm mothers averaged 0.0563, and in the non-farm mothers 0.0635 ppm, with a maximum of 0.466 ppm. The dieldrin averages were also higher among the non-farm mothers. Of the total BHC 95% was β-BHC. The contamination source was traced to the diet of mothers who consumed relatively large amounts of beef and milk daily. According to a dietary investigation of the total population, the intake of animal protein and fat is greater among the non-agricultural families than among the agricultural families, the former consuming four times as much beef and twice as much milk as the latter. A followup investigation between November 1971 and February 1972 on 398 samples from 38 prefectures also showed a 100% detection of both BHC and DDT in mothers' milk, 75% of dieldrin, and 42% of heptachor epoxide. The total BHC content was 82.9% of the previously recorded value; the total DDT residue was 88.6% and the dieldrin residue was 85.7%.

73-1058. Bjerk, J. E. (Inst. for Farmakol. og Toksikol., Norges Veterinaerhogskole, Oslo, Norway). **Rester av DDT og PCB i norsk brisling (*Clupea sprattus*) og sild (*Clupea harengus*). [Residues of DDT and PCB in Norwegian sprat (*Clupea sprattus*) and herring (*Clupea harengus*).]** *Nord. Vet. Med. 24(9): 451-457; 1972.* (11 references) (Norwegian)

DDT and PCB residues were determined in homogenates of sprats and herrings caught in Norwegian coastal waters. Sprats contained up to 0.2 ppm of total DDT, or 0.5 ppm on a fat weight basis. One sample of sprat from the Baltic Sea had appreciably higher DDT contents, and high PCB levels. PCBs were found only in fish from Trondheims fjord and the Oslo fjord, with all values being below 0.5 ppm or 3.4 ppm on a fat weight basis. Sprats from Scottish waters contained little DDT and no PCBs at all. Sprats caught outside a sewage treatment plant in Oslo harbor had high PCB levels (up to 16 ppm in muscle tissues on a fat weight basis), and the DDT residue levels were also high. Herring from Broennoeysund, not more than one year old, contained only traces of DDT and no PCBs. Herring caught just before spawning off Kristiansund showed 1.3 ppm of total DDT and 1 ppm of PCB (on a fat weight basis) in the muscle. The liver contained traces of PCBs and 0.8 ppm of DDT. The demonstrated residue levels are considerably lower than those obtained for Baltic samples.

73-1059. Masuda, T.; Kanazawa, J. (Min. of Agr. and Forestry, Inst. of Agr. Tech., Japan). **[Residues of organophosphorus insecticides in crops treated with granular formulations.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 29: 29-35; 1972.* (7 references) (Japanese)

Unpolished rice was harvested from potted plants 53 days after being treated with a granular formulation containing diazinon, dimethoate, and disulfoton, at rates of 250 and 750g a.i./10 are. The samples contained 0.004 and 0.009 ppm of unaltered diazinon, 0.26 and 0.60 ppm of dimethoate including its metabolite, and 0.18 and 0.47 ppm of disulfoton including its metabolites. Residues in the soil 60 days after treatment were 0.334 and 0.449 ppm of unaltered diazinon, 0.034 and 0.190 ppm of dimethoate including its metabolite, and 1.23 and 3.51 ppm of disulfoton including its metabolites. Carrot, Chinese cabbage, and turnip were harvested from growing pots in which disulfoton had been applied uniformly to the depth of 2 cm before sowing at the rate of 500g a.i./10 are. Carrot contained 2.05 (top) and 1.43 ppm (root) 110 days after treatment; turnip 0.77 (top) and 0.25 ppm (root) 58 days after treatment; and Chinese cabbage 1.36 and 0.73 ppm (top) and 1.36 and 0.73 ppm 49 and 59 days after treatment. The residues of disulfoton in crops consisted mainly of sulfone, sulfoxide, and very little sulfide. When the amounts of residues of potted unpolished rice and paddy field unpolished rice were compared, the former contained more than the latter, suggesting the importance of the water leaching.

73-1060. Uhlig, R. (Staatliche Chemische Untersuchungsanstalt, Augsburg, Germany). **Diaetnahrung in lebensmittelchemischer Sicht. [Chemical aspects of dietetic foods.]** *Oeff. Gesundheitsw. 32: 462-468; 1970.* (7 references) (German)

Problems of the composition and residue contents of dietetic foods are reviewed. The deceptive requirement for the absolute absence of pesticide residues from baby food is being increasingly replaced by the implementation of definite residue standards. Mild symptoms of poisoning with loss of weight and reduction of the blood vitamin A level were observed in babies after consumption of aldrin and dieldrin contaminated carrots. Only two out of 21 chicken samples labeled as baby food were free from pesticide residues; the rest contained lindane, BHC, DDT, and dieldrin at less than 1 ppm in fat. An investigation of 48 samples of regular oatmeal revealed 0.01-0.04 ppm of lindane in 15 samples, 0.1-6.4 ppm of malathion in 26 samples, and 0.07 ppm of DDT in 1 sample; another 19 samples contained no detectable amounts of pesticides. Oatmeal intended for use as baby food (30 samples) contained 0.02-0.5 ppm of lindane (16 samples) and 0.5-3.0 ppm of malathion (26 samples). No pesticide residues were detected in 3% of these samples.

73-1061. Borneff, J. (Hygiene-Institut, Mainz, Germany). **Chemische Schadstoffe im Wasser. [Chemical pollutants in water.]** *Oeff. Gesundheitswes. 34: 117-130; 1972.* (35 references) (German)

Problems involved with the presence of chemical pollutants in water.] *Oeff. Gesundheitsw. 34: 117-130;* henyls, pesticides, polycyclic aromatic hydrocarbons, phenols, and metals in surface and ground waters are reviewed. Readily degradable, highly toxic pesticides are less of a problem than persistent organochlorine compounds such as DDT. Organochlorine pesticides entering the human body through vegetables, meat, eggs, milk and milk products as well as possibly through water accumulate in adipose tissues. The average organochlorine (DDT, lindane, dieldrin) contents of human fat in Germany, the U.S., and the DDR are 5, 8, and 13 mg/kg, respectively. The DDT intake with vegetables accounts for about 25% of the total quantity ingested. Organochlorine pesticides cause reduced fertility, genetic troubles, and neurohormonal disturbances; direct embryotoxic effects are also possible. Mild symptoms of poisoning were observed in children after consumption of aldrin and dieldrin contaminated carrots. The highly stable PCBs interfere with enzymatic and hormonal processes and can metabolize sex hormones and some medicaments into water-soluble compounds. Human fat contains about 5 mg of PCB per kg.

73-1062. Matsunaga, K.; Sueishi, T.; Ogino, Y.; Morita, K.; Hayashi, T.; Torii, I.; Ishida, T.; Ueno, S.; Yamada, H.; Kano, K. (Okayama Prefect. Hyg. Lab., Okayama, Japan). **[Study on pesticide residues (1). Residues of organochlorine pesticides in milk.]** *Okayama-ken Eisei Kenkyusho Nenpo (Annu. Rep. Okayama Prefect. Pub. Health Lab.) 19: 31-40; 1972.* (3 references) (Japanese)

Pollution of cows' milk by organochlorine pesticides was investigated in Okayama Prefecture between January 1970 and March 1972. Determinations were made by gas chromatography and the geographical distribution and seasonal fluctuation examined. The organochlorine content was quite high. The percentage of pesticide residues was approximately 82% total BHC, approximately 16% total DDT, and approximately 2% dieldrin. The total content of BHC decreased to about 16% by March 1972. Beta-BHC content was 72-76% in 1970 and 66% in 1971 in both fresh and market sold milk. Alpha-BHC was 17-24%. The BHC content in the milk of cows raised without the use of straw gradually decreased from 0.136 ppm at the beginning of the study to 0.029 ppm one year later. An increase of total BHC was noted during the fall to winter of 1970 and coincided with the season of new rice straws.

73-1063. Ahmad, M.; Abdullah, A. (Dept. of Entomol., Agr. Univ. Lyallpur, Pakistan). **Determination of residues of Dimecron, endrin, and malathion on tobacco**

plants, using bioassay technique. *Pak. J. Sci. Res. 23(1-2): 34-41; 1971.* (8 references)

Residues of Dimecron (phosphamidon), endrin, and malathion on tobacco leaves were determined up to 12 days after application of each insecticide at concentrations of 0.025 and 0.05% in May of 1968 and 1969. In the first year, the maximum phosphamidon residue of 43.74 ppm, observed at 24 hr, declined to 0.87 ppm by the tenth day. About 83% was lost within six days. Approximately 90% of the initial endrin residue (maximum, 73.69 ppm) had disappeared within three days of treatment. Malathion had a maximum residue of 66.68 ppm of which 97% was lost in six days. Levels observed after spraying in 1969 differed somewhat from those in 1968, but decreased at approximately the same rate.

73-1064. Beynon, K. I.; Bosio, P.; Elgar, K. E. (Shell Res. Ltd., Woodstock Agr. Res. Centre, Sittingbourne, Kent, England). **The analysis of crops and soils for the triazine herbicide cyanazine and some of its degradation products.** *Pestic. Sci. 3(4): 401-408; 1972.* (5 references)

Crops and soils from field trials in 1967-1970 in several countries have been analyzed for residues of the triazine herbicide cyanazine and its degradation products 2-chloro-4-(1-carbamoyl-1-methylethyl-amino)-6-ethylamino-1,3,5-triazine (II), 2-chloro-4-(1-cyano-1-methylethylamino)-6-amino-1,3,5-triazine (V), and 2-chloro-4-(1-carbonyl-1-methylethylamino)-6-amino-1,3,5-triazine (VI). The time for the concentration of cyanazine in soils to fall to half the initial value was in the range 1.3 to 5 weeks with a mean value of 2.4 weeks. The rate of loss was not affected by sparse crop cover, and there was some indication that the rate was greater under moist soil conditions. Residues of up to 0.5 ppm of (II) and up to 0.08 ppm of (VI) were detected in soils at 4 weeks from cyanazine application at 2 kg/ha. The residues of cyanazine and the degradation products declined rapidly and were 0.07 ppm or less at 16 weeks from treatment. Repeated annual applications did not lead to a detectable build up of residues in soil. Neither residues of cyanazine nor those of (II), (V), or (VI) could be detected in a wide range of crops harvested from soil treated in accordance with the likely recommendations, and the limits of detectability were 0.01 to 0.04 ppm. (Author abstract by permission)

73-1065. Rajzman, A.; Heller, H. (Div. of Fruit and Vegetable, Volcani Inst. of Agr. Res., Rehovot, Israel). **The fate of sodium 2-phenylphenate and biphenyl applied to citrus fruit in wax coatings.** *Pestic. Sci. 3(4): 457-463; 1972.* (11 references)

The fate of the fungicide in stored citrus fruit treated with wax coatings containing either sodium 2-phenylphenate (SOPP) or biphenyl was studied. The 2-phenyl-phenol content of SOPP-treated fruits was virtually unchanged during storage, was localized in the peel and could not be detected in the vapor phase. The persistence of this fungicide on fruit is in accord with the satisfactory results obtained with SOPP waxes. Biphenyl volatilized from biphenyl-waxed fruit at rates reflecting the conditions of storage. The volatilization of biphenyl accounts for the protective action of biphenyl-waxes and their time limited effect. (Author abstract by permission)

73-1066. Beitz, H.; Pank, F.; Ehrt, M. (Inst. fuer Pflanzenschutzforsch. Kleinmachnow, Deut. Akad. der Landwirtschaftsw. zu Berlin, DDR). **Pflanzenschutzmittel-Rueckstaende an Arznei- und Gewuerzpflanzen–Dimethoat-Rueckstaende an Kuemmel und Fenchel. [Pesticide residues in medicinals and herbs–dimethoate residues in caraway and fennel.]** *Pharmazie 27(4): 265-268; 1972.* (16 references) (German)

Dimethoate residues were determined in green parts and crops of caraway and fennel after one to three sprayings with a 0.075% preparation. A thin-layer chromatographic determination was done on silica gel using benzene-acetone or *n*-hexane-acetone as the developing solvents. Silver nitrate and potassium hexaiodoplatinate were used as spray reagents for semiquantitative determination. The dimethoate residues in the straw and seeds of caraway following two sprayings were 0.4 and 0.5 ppm; seeds of caraway treated only once contained no pesticide. Seeds of fennel plants treated once and twice contained 0.2 and 1.1 ppm of dimethoate, respectively. The results indicate increased persistence of dimethoate in both caraway and fennel as compared to other plants, probably due to the presence of volatile oils. The drying of the oils leads to an increase in the pesticide residue level in the crops. The use of dimethoate on caraway and fennel is recommended for single applications only.

73-1067. Engst, R.; Knoll, R. (Zentralinst. fuer Ernaehrung in Potsdam-Rehbruecke, Deut. Akad. der Wissenschaften zu Berlin, DDR). **Rueckstaende von chlorierten Kohlenwasserstoffen in Humanmilch. [Organochlorine pesticide residues in human milk.]** *Pharmazie 27(8): 526-531; 1972.* (44 references) (German)

Organochlorine pesticide residues in 75 pooled, and two unmixed human milk samples were investigated in 1969 and in 1970 by thin-layer chromatography with a sensitivity of 0.05 ppm. No *p,p'*-DDT and *p,p'*-DDE were detected in three pooled milk samples; the average *p,p'*-DDT and *p,p'*-DDE residue contents in 57 samples from 1969 and another 18 samples from 1970 were 0.07 and 0.14 ppm and 0.05 ppm and 0.10 ppm, respectively. The unmixed milk samples contained 0.25 and 0.41 ppm of total DDT. Traces of *p,p'*-DDD (TDE) were detected in some samples. Comparative thin-layer and gas-chromatographic investigations revealed the possible

presence of PCBs. Findings suggesting the presence of α-BHC and γ-BHC traces in some samples are considered unreliable.

73-1068. Beitz, H.; Pank, F. (Inst. fuer Pflanzenschutzforsch. Kleinmachnow, Deut. Akad. der Landwirtschaftsw. zu Berlin, DDR). **Pflanzenschutzmittel-Rueckstaende an Arznei- und Gewuerzpflanzen. Methylparathion-Rueckstaende an Fenchel (*Foeniculum vulgare* Mill.) und Pfefferminze (*Mentha piperita* L.). [Pesticide residues in medicinals and herbs. Methyl parathion residues in fennel (*Foeniculum vulgare* Mill.) and peppermint (*Metha piperita* L.).]** *Pharmazie 27(8): 532-534; 1972.* (10 references) (German)

A 0.035% preparation of methyl parathion was applied 1 to 3 times during the growing period. The methyl parathion residues in crops of fennel and peppermint ranged from 0.03 to 0.13 ppm and from 0.012 to 0.045 ppm, respectively. The third application of the pesticide considerably increased the residue level. The residue determination was done with thin-layer chromatography on silica gel following extraction with benzene. Development with a benzene-cyclohexane mixture was followed by the application of liver homogenate, incubation at 37 C over 1 hr, and the application of indoxylacetate as a substrate for semiquantitative determination.

73-1069. Siriez, H. (Author address not given). **Le coton, culture textile et oleagineuse, les residus de DDT et le gossypol. [Cotton produced for fiber and oil—DDT residues and gossypol.]** *Phytoma 25(244): 30-31; 1973.* (French)

General problems of DDT residues and gossypol in cotton seed and cotton-seed oil are outlined. The use of DDT for food crops is steadily declining in the U.S.; however, DDT is still used profusely for cotton grown for fiber and oil. The problem of DDT residues in cotton seed is insignificant compared to that of toxic gossypol, which considerably limits the use of cotton seed, especially for animal feed.

73-1070. Namdeo, K. N. (Jawaharlal Nehru Agr. Univ., Coll. Campus, Rewa, Madhya Pradesh, India). **Persistence of dalapon in grassland soil.** *Plant Soil 37(2): 445-448; 1972.* (9 references)

Dalapon persisted in samples of a nonsterile grassland oxisol for up to 10 weeks of incubation. At the 50 ppm level about 50% had disappeared within four weeks; at the 10 ppm level, approximately 50% remained after only one week. Its disappearance was markedly slower in autoclaved soil. Decomposition was more rapid and a build-up of dalapon-decomposing microorganisms seemed to occur in a soil perfusion column. Bacteria were primarily responsible for the degradation with actinomycetes also important. The dalapon-decomposing bacteria remained fairly high under field conditions even six months after dalapon application.

73-1071. Parsons, A. M. (Unilever Res. Lab., Welwyn, Herts, England). **Pesticide residues in fats and other lipids.** *Progr. Chem. Fats Other Lipids 11(Pt. 2): 243-293; 1970.* (387 references)

Various aspects of organochlorine pesticide residues in fats are reviewed. The pesticides are now generally separated from the triglycerides by partition between acetonitrile and hexane or DMF and hexane, and column chromatography. Extracts are examined by spectrophotometry, thin-layer chromatography, or electron-capture GLC. Several metabolites including TDE have occurred in lipids together with the parent pesticides. Lindane, dieldrin, and endrin are metabolized to more polar products. Results of residue monitoring studies in humans, wildlife, domestic animals, and vegetable oils from various parts of the world are included. In general, body fat of domestic animals contains less than that of human inhabitants of the same country. A wide dispersion of organochlorines is evident from the levels observed in wildlife in the ocean and on the Antarctic continent. Toxicity data included illustrates the differences in response to the organochlorines dependent on route of administration, sex, and species. Whether acute toxicity can result in all species from mobilization of fat containing organochlorine residues is unresolved. Dieldrin and heptachlor epoxide are less readily metabolized than lindane and endrin, and DDT is most rapidly metabolized, at least in mammals.

73-1072. Mueller, H. (Bundesanstalt fuer Qualitaetsforschung pflanzlicher Erzeugnisse, Geisenheim, Germany). **Ein Beitrag zum Einsatz des Wachstumsregulators Chlorcholinchlorid (CCC) im Gemuesebau. 1. Mitt.: Bestimmung von Chlorcholinchloridrueckstaenden bei Kohlrabi (*Brassica oleracea* var. Gangylodes), Blumenkohl (*Brassica oleracea* var. Botrytis) und Tomaten (*Lycopersicon esculentum*). [The use of the plant-growth regulator chlorocholine chloride (CCC) in vegetable crops. Part 1. Determination of residues of chlorocholine chloride in kohlrabi, cauliflower, and tomatoes.]** *Qual. Plant. Mater. Veg. 22(1): 65-81; 1972.* (18 references) (German)

Chlormequat chloride (CCC) residues in *Brassica oleracea* var. Gangylodes, cultivars "Rogglis Weisser Treib" and "Ozean," *Brassica oleracea* var. Botrytis, cultivar "Delfter Markt," and in *Lycopersicon esculentum* cultivar "Eurocross A" were determined by thin-layer chromatography. Each of the plants, grown in Mitscherlich pots, was sprayed or watered with 25-250 mg of chlormequat chloride. Dose-dependent residues were measured in edible parts of kohlrabi (1-1.5 ppm in cultivar "Rogglis Weisser Treib" and 1.65-2.15 ppm in cultivar "Ozean"), cauliflower (0.5-1.61 ppm), and tomato (0.97-24.7 ppm). A gradual decrease in the

residue levels in fruits toward the top of the plant was observed. The residue levels in tomato fruits were dependent on the time of application. Leaf treatment (spray) led to higher residue levels in both cauliflower (up by 70% at a rate of 50 mg) and tomatoes (up by 300% at rates of 50, 125, and 250 mg) than did soil application (watering). Cooking of kohlrabi and cauliflower transferred 65 and 30% of the respective residue contents into the cooking water.

73-1073. Maki, S. (Author address not given). **[Pesticides and their toxicity, Part III.]** *Ringyo to Yakuzai (Forest. Pestic.) 42: 16-18; 1972.* (Japanese)

Residues resulting from field application of sodium chlorate were determined. On July 19, sodium chlorate was applied at 150, 200, and 250 kg of 50% dust and granular formulations per ha of clayey loam forest soil covered with *Sasa borealis var. purpurescens.* Just after the application, sodium chlorate remaining on the soil was estimated at 70-150 ppm. The soil was sampled at intervals and the residue analyzed as $NaClO_3$. The values were 8.0, 9.8, and 9.5 ppm at 7 days; 8.5, 9.0, and 9.5 ppm at 27 days; 6.0, 4.6, and 5.7 ppm at 64 days; 2.8, 3.6, and 3.0 ppm at 98 days, and 1.3, 4.4, and 3.3 ppm 123 days after application of 150, 200, and 250 kg of 50% granular formulation, respectively. The residues on the same days (64, 98, and 123 days) after application of the 50% powder formulation were about half of those for the granular formulation. With both types of formulation, no residue was detected 132 days after application. The residue decreases rapidly during the first month of application and remains for about 100 days at a level of 10-1 ppm.

73-1074. Takeshita, T. (Shimane Prefect. Inst. of Pub. Health, Matsue, Japan). **[Investigation of pesticide residue in vegetables and fruits.]** *Shimane-ken Eisei Kenkyusho Nenpo (Annu. Rep. Shimane Prefect. Inst. Pub. Health) 12: 25; 1970.* (Japanese)

Most of the vegetables and fruit examined in 1970 in Shimane Prefecture showed no trace of DDT residue, but two samples of peaches and four samples of pears had relatively high levels (0.45-0.48 ppm and 0.18-0.29 ppm). The individual protective paper wrappers for fruit were suspected as sources of DDT residue. Four kinds of market-sold protective wrappers were examined and two samples contained DDT. Two out of five samples of strawberries and one out of seven samples of tea showed high concentrations of some pesticides which were not included in the standardized pesticide proscription. The 59 samples of vegetables and fruits examined in 1969 were all within safety regulations, most of them having zero to slight traces of pesticide residue. One strawberry sample contained about 4 ppm of sucrex, probably from the soil or the protective straw which came into contact with the fruit.

73-1075. Takeshita, T.; Inuyama, Y. (Shimane Prefect. Inst. of Pub. Health, Matsue, Japan) **[Investigation of pesticide residue in milk.]** *Shimane-ken Eisei Kenkyusho Nenpo (Annu. Rep. Shimane Prefect. Inst. Pub. Health) 12: 26; 1970.* (Japanese)

Five milk samples from the market in 1969 and 16 samples from the market and nine samples of freshly collected milk in 1970 were examined in Shimane Prefecture. Two of the fresh milk samples came from cows that were raised on unsprayed feed and seven samples were taken from various milk collection centers at the request of dairy manufacturers. Gamma-BHC (lindane) residues in the market milk showed a decreasing trend in 1970, but αBHC and β-BHC showed little change. The two samples taken from cows raised on unsprayed feed showed generally lower figures. The α-, β- and γ-BHC levels in the market milk in 1969 were 0.015, 0.110, and 0.009 ppm; in July 1970, they were 0.032, 0.117, and 0.002 ppm; and in November 1970, they were 0.019, 0.114, and 0.001 ppm. In November 1970, the fresh milk from cows raised on unsprayed feed had averages of 0.009, 0.0123, and 0.0003 ppm of α-, β- and γ-BHC while the milk sampled at the collection centers averaged 0.023, 0.105, and 0.0014 ppm.

73-1076. Takeshita, T.; Inuyama, Y. (Shimane Prefect. Inst. of Pub. Health, Matsue, Japan). **[Organochlorine residues in mother's milk and blood.]** *Shimane-ken Eisei Kenkyusho Nenpo (Annu. Rep. Shimane Prefect. Inst. Pub. Health) 12: 27-28; 1970.* (Japanese)

Milk samples were taken from fifteen mothers nursing their babies for more than one month and analyzed for organochlorine residues. Five women were from agricultural families, and 10 were from non-agricultural families; nine of them were analyzed for organochlorine residues in blood. In the milk of mothers from agricultural families the averages of α-, β- and γ-BHC (lindane) were 0.0038, 0.134, and 0.0051 ppm respectively, with maxima of 0.0082, 0.350, and 0.0072. In the mothers from non-agricultural families the averages were 0.0059, 0.233, and 0.0120 ppm respectively with maxima of 0.0170, 0.560, and 0.034. The total DDT residues averaged 0.079, with a maximum measurement of 0.160 in the mothers from the agricultural families and 0.066 ppm average with a maximum of 0.129 in the mothers from the non-agricultural families. Neither aldrin nor endrin were detected, but a maximum of 0.012 ppm of dieldrin was found in the agricultural group and 0.043 ppm in the non-agricultural group. An average of 0.001 ppm of α-BHC was traced in the blood of the non-agricultural group with a maximum of 0.002 ppm. The β-BHC isomer averaged 0.017 ppm with a maximum of 0.027 in the same group. In all cases, higher residue measurements were found in the women from non-agricultural families.

73-1077. Takeshita, T. (Shimane Prefect. Inst. of Pub. Health, Matsue, Japan). **[BHC content in the drinking water of Matsue City.]** *Shimane-ken Eisei Kenkyusho Nenpo (Annu. Rep. Shimane Prefect. Inst. Pub. Health) 12: 29-31; 1970.* (Japanese)

The drinking water for the city of Matsue has been sampled at two reservoirs and the BHC content analyzed weekly by gas chromatography since October 1969. As of March 1971, 209 samples have been tested, and during the summer one analysis was performed on samples from 28 drinking water installations. Monthly fluctuations of BHC residue showed that there was a high peak in June-July 1970 and another peak in September. These peaks coincided with the administering of pesticides in the basins. In August 1970 vertical distributions of BHC content and water temperature were measured at one of the dams and differential distributions noted in both water depth and BHC residue. It was conjectured that the difference in the temperature between the winter water layer and the summer water layer prevented the two layers from mixing and concluded that samples should be taken from various depths when analyzing the reservoir water. In general, the water temperature and BHC content decreased with increasing depth. The α-BHC level was 2.48 ppb at 0.3 m, 2.50 at 3 m, 0.36 at 8 and 10 m, and 0.18 at 20 m. The β-BHC level was in the range of 0.90 ppb down to 3 m, 0.16 at 10 m, and 0.10 ppb at 20 m. The γ-BHC level was 1.80 ppb at 0.3 m, 1.45 at 3 m, 0.28 at 8 m, 0.22 at 10 m, and 0.08 at 20 m.

73-1078. Tatsukawa, R.; Wakimoto, T.; Ogawa, T. (Ehime Univ., Coll. of Agr., Matsuyama, Japan). **[BHC in the environment.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Japan) 11(1): 1-8; 1970.* (9 references) (Japanese)

The overall picture of BHC as an environmental pollutant in Japan is reviewed. BHC use is heavily concentrated in western Japan, especially in Kyushu. The total consumption of BHC in 1968 for Japan was 450,000 tons, which gave an average β-BHC level of 900 g/ha; in Fukuoka and Saga Prefecture in Kyushu, 4000 g/ha was the average. The residue in the soil is highest along the Sea of Ariake (Kyushu), at 1.8 ppm maximum and 0.38 ppm average. Residual BHC mostly accumulates in the upper 5-15 cm of soil and does not seem to move down toward lower layers. Alpha-BHC evaporates and degrades relatively easily; the residue content of γ-BHC (lindane) in the warm areas of the southwest is only several percent; the rate is rather high in northern Japan. A correlation between γ-BHC in the soil and the cumulative temperature is conjectured. BHC residues in river water, rainwater, and atmospheric air, in ocean water and the seabed, and residues in fish, sparrows, and rice plants are discussed briefly. Rather high levels of γ-BHC residues have been reported in small clams (250 ppm), catfish (300 ppm), and another type of fish (100 ppm).

73-1079. Best, J. A.; Weber, J. B.; Weed, S. B. (N. Carolina State Univ., Raleigh, NC). **Competitive adsorption of diquat, paraquat, and Ca^{2+} on organic matter and exchange resins.** *Soil Sci. 114(6): 444-450; 1972.* (12 references)

Paraquat, diquat, and Ca as $CaCl_2$ were similarly adsorbed to soil organic matter, probably because of the flexibility (coiling and uncoiling) of the polymeric structure of this material. In competitive adsorption studies, a histosol and its humic and humin fractions had affinities for these cations in the order: paraquat $\geqslant$ diquat $>$ Ca on strong acid sites and Ca $>$ paraquat $>$ diquat on weaker acid groups. The order for a strong acid resin was diquat $>$ paraquat $>$ Ca and for a weak acid resin it was Ca $>$ diquat $>$ paraquat. Steric hindrance and the relationship between surface charge density of the adsorbents and cation charge spacings were probably responsible for preferential adsorption.

73-1080. Fair, J. G.; Sanders, G. G.; Collins, J. L.; Johnston, M. R. (Dept. of Food Technol. Sci., Univ. of Tennessee, Knoxville, TN 37901). **Foods processed in East Tennessee found to be relatively free of pesticide residue.** *Tennessee Farm and Home Science Progress Report No. 83, Agricultural Experimental Station, Knoxville, 1972, pp 2-3.* (4 references)

Of the 1,050 samples of fresh, commercially canned, and dried foods collected in east Tennessee, only 96 had any detectable pesticide residue. Seven samples contained pesticides at 1 ppm or more and nine were slightly greater than the legal tolerance. Residues detected included DDT, kelthane, endrin, aldrin, toxaphene, heptachlor, and dieldrin. With increasing care in the use of pesticides it is expected that even fewer samples will contain detectable pesticide residues.

73-1081. Kerner, I.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellschaft fuer Strahlen- und Umweltforschung mbH, Munich, Germany). **Beitraege zur oekologischen Chemie. 33. Photochemische Reaktionen von 1,1-dichlor-2(p,p'-dichlorphenyl)aethylen (DDE). [Contributions to environmental chemistry. Part 33. Photochemical reactions of 1,1-dichloro-2 (p,p'-dichlorophenyl)ethylene (DDE).]** *Tetrahedron 28(6): 1575-1578; 1972.* (7 references) (German)

Metabolites formed by dissolved, solid, and gaseous DDE in UV light were studied. The UV irradiation of DDE in *n*-hexane resulted in the known metabolites DDCO (II) and monodechlorinated DDE (III), a photoisomerization product IV, and two metabolites V and VI resulting from reaction with the solvent. The proportions of metabolites II, III, IV, V, and VI after 8-day irradiation were 5, 45, 35, 5, and 10%, respectively, and all DDE had been consumed. Irradiation of DDE in acetone or in an acetone-water mixture resulted in a total of 3% of the metabolites II, III, and IV in 72 hours. Irradiation of DDE in dioxane-water with lead

acetate as catalyst produced 5% of two unidentified metabolites while the metabolites in a dioxane-water mixture alone were II, III, and IV. The total quantity of metabolites II, III, and IV, formed from irradiated solid DDE in one, two, and ten days was 20, 60, and 88%, the respective proportions of metabolites II, III, and IV on the tenth day being 40, 45, and less than 1%. Solid DDE irradiated for three days in the presence of chlorophyll formed 90% of metabolite IV, 5% of III, and less than 1% of I. The 30 min irradiation of gaseous DDE resulted in the formation of 8% of metabolite III and of 12% of metabolite IV.

73-1082. Dupuy, A. J.; Schulze, J. A. (Texas Water Development Board, P.O. Box 13087, Austin, TX 78711). **Selected water-quality records for Texas surface waters, 1970 water year.** *Texas Water Development Board Report 149, 1972, 211 p.* (9 references)

Four tables have been compiled which contain the results of pesticide monitoring in surface waters and bottom deposits at selected sites on streams throughout Texas in 1970, along with selected biochemical and chemical records and records of minor elements in surface waters. Organochlorines measured include: aldrin, TDE, DDE, DDT, endrin, dieldrin, heptachlor, heptachlor epoxide, lindane, chlordane, toxaphene, and BHC. The phosphorodithioates include: parathion, methyl-parathion, malathion, and diazinon. Measurements in surface waters were recorded in μg/l. and results were negative for many of the sites. Positive results were obtained more frequently with the herbicides 2,4-D, 2,4,5-T, or silvex. Bottom sediment measurements were expressed in μg/kg and representatives of all three groups were found in most of the sediment samples.

73-1083. Brown, J. R. (Univ. of Toronto, Toronto, Canada). **Concentration of chlorinated hydrocarbon pesticides in human blood and their relation to the concentration in depot fat.** *Toxicol. Appl. Pharmacol. 22(2): 327-328; 1972.*

Blood samples have been taken from the populations of two agricultural areas and one pesticide industry in Ontario. In all, a total of 421 samples of blood have been taken, 50 of these from industry. Human fat samples have been taken from 52 persons and compared with blood samples taken from the same individuals with respect to their total DDT-derived material content. It has been found that the ratio of total DDT-derived material fat/blood is 140:1. The majority of the DDT-derived material was present as DDE. Any DDT found usually was due to recent exposure to this material. The methods used for analysis give results which are approximately twice those obtained from current methods. The median value of DDT-derived materials for blood of nonexposed persons was about 0.02 ppm and for those exposed about 0.05 ppm. These results were lower for the Canadian population studied than for similar areas reported in Israel and in the United States. However, the relationship between blood and fat levels would appear to be constant, and, therefore it would seem likely that blood determinations of total DDT derived material would give a useful indication of the body storage of this material. From examination of this work there does not seem to be any correlation between the amount of DDT-derived material in the biosphere and that found in man. (Author abstract by permission) (Abstract No. 141)

73-1084. Nagai, I. (Sect. of Environ. Health, Yamaguchi Prefect. Res. Inst. of Health, Japan). **[Residues of organochlorine pesticides in mothers' milk in Yamaguchi Prefecture.]** *Yamaguchi-ken Eisei Kenkyusho Nenpo (Annu. Rep. Yamaguchi Prefect. Res. Inst. Pub. Health) 14: 93-94; 1972.* (Japanese)

Organochlorine pesticide residues were determined in five specimens of mothers' milk collected from each of four local health centers of Yamaguchi Prefecture in July-Aug. 1971 or Jan.-Feb. 1972. Specimens from Oshima contained an average of 0.03 ppm α-BHC, 0.13 ppm β-BHC, 0.02 ppm γ-BHC (lindane), 0.01 ppm δ-BHC, 0.02 ppm *p,p'*-DDT, and 0.007 ppm *p,p'*-DDD (TDE). Samples from Nagato averaged 0.017 ppm α-BHC, 0.184 ppb β-BHC, 0.012 ppm γ-BHC, 0.006 ppm δ-BHC, 0.031 ppm DDT, and 0.006 ppm TDE. The specimens collected at the Yanai center revealed an average α-BHC content of 0.002 ppm, β-BHC 0.085 ppm, γ-BHC 0.003 ppm, δ-BHC 0.004 ppm, DDT 0.012 ppm, and TDE 0.004 ppm. The specimens from Asa contained an average of 0.007 ppm α-BHC, 0.233 ppm β-BHC, 0.003 ppm γ-BHC, 0.004 ppm δ-BHC, 0.033 ppm DDT, and 0.003 ppm TDE. Polychlorinated cyclodienes were only detected in the specimens from Yanai at 0.002-0.004 ppm with 0.003 ppm as aldrin. The most striking finding was the high β-BHC content of the mothers' milk which exceeded the provisional tolerance of 0.2 ppm established for cows' milk by the Ministry of Health and Welfare of Japan.

73-1085. Nagai, I. (Section of Environ. Health, Yamaguchi Prefect. Res. Inst. of Health, Japan). **[Pesticide residues in and on vegetables and fruits in Yamaguchi Prefecture.]** *Yamaguchi-ken Eisei Kenkyusho Nenpo (Annu. Rep. Yamaguchi Prefect. Res. Inst. Pub. Health) 14: 94-95; 1972.* (Japanese)

Vegetables and fruits grown in several parts of Yamaguchi Prefecture were examined for pesticide residues. Japanese radish tops contained 1-2 ppb lindane, 1-2 ppm DDT, and no detectable organophosphates or polychlorinated cyclodienes. Japanese radish roots contained traces of lindane, up to 2 ppm DDT, and no other detectable pesticides. Spinach leaves contained 1-18 ppb lindane, trace-23 ppb DDT, 18 ppb aldrin, and 0.93-1.70 ppm lead. Cucumber samples contained only 1 ppb

lindane and 1.3 ppm lead. Tomato contained traces of lindane and cyclodienes and 0.2-0.5 ppm lead. Apples contained trace-31 ppb lindane, 0-13 ppb DDT, 1-53 ppb aldrin, and 0.7-2 ppm lead; Japanese pear contained 1 ppb lindane, trace-1 ppb aldrin, and 1.0-2.3 ppm lead. Grapes contained up to 4 ppb lindane, 88 ppb DDT, and 0.2-0.3 ppm lead; peaches contained only traces of lindane and 0.3 ppm lead. Summer orange peel contained 1-2 ppb lindane, up to 0.15 ppm arsenic, and 0.7-1.8 ppm lead; and summer orange pulp, 2-5 ppb lindane, 0.02 ppm arsenic, and 0.2-0.5 ppm lead. The only pesticide detected in green tea was 8-33 ppm lindane.

73-1086. Imre, R. A.; Berencsi, G.; Luzsanyi, L.; Maurer, J. (Inst. Hyg., Med. Univ., Szeged, Hungary). **Ueber die Quecksilberverunreinigung des Bodens in Verbindung mit der Benutzung quecksilberhaltiger Beizmittel. [Soil contamination caused by the use of mercury-containing seed dressings.]** *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. 1 Orig. Reihe B 155(5-6): 476-481; 1972.* (15 references) (German)

Mercury contents were determined in soils in which seed grain treated with methoxyethylmercury chloride preparations (Higosan and Granosan) had been sowed for four consecutive years. The amount of mercury thus introduced into the soil was about 9.6 g per ha per year. The mercury contents at 20, 30, 50, 70, and 90 cm depths were 0.5, 0.175, 0.21, 0.176, and 0.105 ppm, respectively, which indicates the possibility of ground water contamination. Significant differences in the mercury content of crumbly and cloddy parts of deep soils in contact with ground water were observed. Clods contained much more mercury than crumbly soil.

73-1087. Imre, R. A.; Berencsi, G. (Inst. Hyg., Med. Univ., Szeged, Hungary) **Spiegelt sich Quecksilberverunreinigung des Bodens in den produzierten Pflanzen? [Is contamination of the soil with mercury reflected by the plants grown on it?]** *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. 1 Orig. Reihe B 155(5-6): 482-487; 1972.* (21 references) (German)

Mercury absorption by lettuce, carrot, parsley, and radish grown in soils containing 0.3, 3, and 30 ppm of mercury from Granosan treatment was studied in model experiments. While the mercury contents in leaves and roots of lettuce and carrot were largely the same in spite of the soil mercury content (0.05 ppm in leaves and 0.08 ppm in roots of both lettuce and carrot), the mercury levels in parsley and radish reflected the soil mercury contents. Leaves and roots of parsley contained less than 0.1 ppm and 3 ppm of mercury, respectively. Up to about 0.15 ppm of mercury in leaves and about 0.1 ppm in tubers of radish were determined.

73-1088. Wolter, D.; Rugenstein, H. (Hygiene-Institut, Bezirk Schwerin, DDR). **DDT in Oberflaechengewaessern. [DDT in surface waters.]** *Z. Gesamte Hyg. 17(4): 264-266; 1971.* (14 references) (German)

Cases of surface water contamination with DDT due to aerial pesticide application in the DDR are described and hygienic aspects of the contamination of drinking water and recreational surface waters with DDT discussed. The DDT concentration in a lake whose shore was treated with this pesticide decreased from an initial value of 1.2 mg/l. to 0.01 mg/l. in 5 days. In another lake the DDT concentration measured about three weeks after application was 0.003 mg/l. which was further reduced to 0.001 mg/l. by the usual treatment for drinking water supply. Algae such as *Oedogonium* and *Cylindrotheca closterium* are able to take up DDT and reduce the DDT concentration in water; however, they also represent a first stage in the process of DDT accumulation in living organisms. The DDT concentrations in adipose tissues of human infants and adults are 6.9 and 13.1 mg/kg respectively. DDT may have mutagenic, teratogenic, and carcinogenic effects.

73-1089. Malkomes, H. P. (Inst. Pflanzenkr. Pflanzenschutz, Technische Univ. Hannover, Hanover, Germany). **Der Einfluss von Bodenbegasungen mit Methylbromid (TERABOL) auf gaertnerische Kulturpflanzen. I. Bromidaufnahme und Bromidtoleranz bei Zierpflanzen. [The influence of soil fumigation with methyl bromide (Terabol) on horticultural plants. I. Bromide uptake and bromide tolerance of ornamental plants.]** *Z. Pflanzenkr. Pflanzenphysiol. Pflanzenschutz 79(5): 274-290; 1972.* (26 references) (German)

The mechanism of the accumulation and elimination of bromide in horticultural soils fumigated with methyl bromide (Terabol) and residue contents in and susceptibility to bromide of ornamental plants such as *Caryophyllus* spp, *Chrysanthemum, Gerbera jamesonii, Rosa* spp. and *Freesia* hybrids were studied. The decomposition of methyl bromide was dependent on the composition and conditions of the soil. Most of the bromide accumulated within the upper layer of the soil, and the bromide concentration in the root zone abated gradually during the vegetation period. While the bromide content in heavy soils remained practically unchanged, it fell to about 5 ppm in intensely watered clayey soils. Bromide-induced damages were observed only in carnations. Chrysanthemum leaves held up to 15,000 ppm of bromide without being damaged. Roses planted immediately after fumigation showed signs of stunting due to residual gaseous methyl bromide in the soil, while other roses planted later in a soil with the same bromide content were not damaged at all. Though the accumulation of bromide in plant parts, especially in leaves, progressed with time, partial decrease of the bromide concentration was observed.

73-1090. Malkomes, H. P. (Inst. fuer Pflanzenkrankheiten und Pflanzenschutz, Technische Univ. Hannover,

Hanover, Germany). **Der Einfluss der Bodenbegasungen mit Methylbromide (TERABOL) auf gaertnerische Kulturpflanzen. II. Bromidaufnahme und -toleranz bei Gemuesepflanzen. [The influence of soil fumigation with methyl bromide (Terabol) on horticultural plants. II. Bromide uptake and tolerance in vegetables.]** *Z. Pflanzenkr. Pflanzenphysiol. Pflanzenschutz 79(6): 321-338; 1972.* (7 references) (German)

The bromide uptake and tolerance of vegetables grown in methyl bromide-fumigated soil was studied. The amount and in-depth distribution of bromide after fumigation of loamy sand with methyl bromide (Terabol) depended on the dosage of the fumigant. A considerable decrease in the soil bromide content during the cultivation of vegetables such as tomato, cucumber, lettuce, turnip, carrot, onion, and celery was found. Although the bromide caused no damage to the plants grown in fumigated soil, the bromide content in the dry matter of the plants varied considerably in different species and in various plant parts. Leaves and stalks contained most of the bromide taken up by the plant while the bromide levels in roots, fruits, and also in young plant parts were usually small. The bromide residues in tomato, turnip, carrot, onion, celery leaves, and lettuce were in the respective ranges of 110-5,908, 4,120-6,356, 1,170-2,687, 237-780, 558-6,467, and 2,489-4,333 ppm on a dry matter basis. The residue levels in the skin and flesh of cucumber were 1,420-2,482 and 570-1,036 ppm, respectively.

See also **73-1015** **73-1016** **73-1112** **73-1253** **73-1262**

73-1091. Carlson, L. A.; Kolmodin-Hedman, B. (Dept. of Geriatrics, Uppsala Univ., Uppsala, Sweden). **Hyper-α-lipoproteinemia in men exposed to chlorinated hydrocarbon pesticides.** *Acta. Med. Scand. 192(1/2): 29-32; 1972.* (15 references)

Fasting serum lipid levels were studied in 22 male subjects occupationally exposed to chlorinated pesticides and compared with levels of 19 nonexposed subjects. Six of the exposed men had hypertriglyceridemia (type IV pattern) and one had hypercholesterolemia (type IIA). Hyper-HDL (α)-lipoproteinemia was found in 42% of the exposed subjects and in none of the controls. The level of HDL (α)-lipoprotein was about 2 to 3 times above average normal values in two of those cases. The changes observed in this investigation could reflect a transport mechanism for pesticides or suggest a subclinical liver effect.

73-1092. Deutsches Zentralinstitut fuer Arbeitsmedizin (Ministerium fuer Gesundheitswesen, Berlin, DDR). **Industrietoxikologie II. Agrochemikalien. [Industrial toxicology II. Section 10: Agricultural chemicals.]** *Arbeitswissenschaftliche Lehrbriefe no. 14-15-16, Verlag Tribuene, Berlin, pp. 125-142.* (German)

Application areas of growth regulators such as chlormequat chloride (CCC), insecticides (including organophosphorus, organochlorine, carbamic acid derived preparations, and natural substances such as nicotine and pyrethrum) and of fungicides, acaricides, nematocides, rodenticides, molluscicides, herbicides, and chemosterilants are described. Toxicology, symptomatology, and first aid and treatment procedures concerning such pesticides are reviewed.

73-1093. Hakkinen, I.; Hernberg, S.*; Siltanen, E.; Seppalainen, A. M.; Karli, P.; Vikkula, E. (Inst. of Occup. Health, Haartmaninkatu 1, 00290 Helsinki 29, Finland). **Diphenyl poisoning in fruit paper production. A new health hazard.** *Arch. Environ. Health 26(2): 70-74; 1973.* (11 references)

Production of diphenyl-impregnated fruit wrapping paper under poor hygienic conditions caused the death of one man and the poisoning of eight other workers. The diphenyl concentrations in the air had been much in excess of the present threshold limit value of 1 mg/cu m. The clinical picture of diphenyl poisoning is characterized by central and peripheral nervous damage and liver injury. The cause of death in the fatal case was acute yellow liver atrophy. In three of the eight men with poisoning, there was histological evidence of liver injury. Changes in the results of blood analysis or renal function did not occur. The prognosis of diphenyl poisoning is still unknown, but some patients showed deterioration when seen after one year. (Author abstract by permission)

73-1094. Faverel-Garrigues, J. C. (Centre Reanim. Resp., l'Hopital Enfants, Bordeaux, France). **Fibrose pulmonaire aigue par ingestion d'herbicide contenant du paraquat. [Acute pulmonary fibrosis due to ingestion of paraquat.]** *Bull. Physio Pathol. Resp. 8(6): 1289-1294; 1972.* (15 references) (French)

Three cases of lethal poisoning due to the ingestion of paraquat are reported. Three periods of the poisoning are distinguished: severe digestive disorders; renal or hepatorenal failure; and pulmonary insufficiency, mostly with lethal outcome. Moderate reduction of the oxygen partial pressure, respiratory alkalosis, classical acute respiratory insufficiency with absence of pulmonary edema, and diffuse fibroblastic growth were observed. The pulmonary manifestations of the poisoning start in the alveolar wall or in the pulmonary tubules. No excretion of the non-volatile paraquat via the lung was determined. Two types of lesions were distinguished: metaplasia, i.e. proliferation of the epithelium of the terminal bronchioles; and fibrosis with infiltration of the alveolar walls by typical fibroblasts around pulmonary tubules, resulting in granulomatous tissue with numerous pseudocysts. No specific antidote for paraquat is available, and symptomatic treatment has no effect on pulmonary insufficiency. A healthy lung transplanted into a victim of paraquat poisoning develops the typical lesions within ten days.

73-1095. Gobbato, F.; Ceccarelli, S. (Ist. Med. Lavoro, Universita di Padova, Padua, Italy). **Importanza e limiti dell'esame otofunzionale nella diagnosi precoce di intossicazione professionale. [Importance and limitations of ear function examinations in the early diagnosis of occupational poisoning.]** *Folia Med. (Napoli) 54: 93-106; 1971.* (28 references) (Italian)

The significance of otological examinations, especially vestibular junction studies, in the diagnosis of occupational poisoning is discussed and a survey of 241 patients with different occupational exposures presented. Five patients in this population were considered to have subacute poisoning by organophosphates such as parathion, malathion, or Systox (demeton). Two of these cases had lesions of the supravestibular pathways, while cochlear damage was ascertained in a third case. Severe poisoning with triorthocresyl phosphate (TOCP) was diagnosed in six patients with polyneuritis and paralysis of the lower limbs; none of these patients presented cochlear or labyrinthine lesions, but three cases showed signs of damage to supravestibular pathways. No conclusions with respect to vestibular function in workers exposed to these pesticides could be drawn due to the small population studied. These symptoms could not be considered as typical, compared to the known neural targets involved in the exposure to toxic chemicals.

731096. Weber, T.; Berencsi, G. (Inst. of Hyg., Szeged College of Medicine, Szeged, Hungary). **Ueber die Permeabilitaet der Schutzhandschuhe fuer verschiedene Pflanzenschutzmittel. [Permeability of various protective gloves for pesticides.]** *Int. Arch. Arbeitsmed. 30: 23-30; 1972.* (10 references) (German)

The permeability of 0.22-0.24 mm thick surgical, 0.5 mm thick plastic, and 1-2 mm thick industrial protective gloves for DNOC and DNBP derived pesticides was studied in model experiments and in vivo on rats. Both experiments evidence penetration of the pesticides through the gloves, making complete protection of the hands impossible. The degree of permeability is dependent on such factors as the material and the thickness of the gloves, the concentration of the pesticide, the temperature, and the exposure time. While acute poisoning due to protective gloves not being completely impermeable is very unlikely, elevated temperatures, handling concentrated pesticide solutions, and prolonged exposure should be avoided; protective gloves should be washed off at certain intervals.

73-1097. Howe, H. F. (AMA Dept. of Environ., Pub. and Occup. Health, Chicago, IL). **Tunnel vision in pesticide control.** *J. Amer. Med. Ass. 223(5): 552-554; 1973.*

An editorial points out the extreme hazards to humans of organophosphates which will be used more heavily as a result of the U.S. ban on most uses of DDT. Although these compounds are less persistent, they are easily absorbed and highly toxic. Proper diagnosis depends on a history of exposure and blood ChE determinations. Severe intoxication is treated by administration of atropine in an amount 10 times the usual therapeutic dose and support of respiration. Pralidoxime chloride is also given.

73-1098. Kimbrough, R. D. (U.S. Environ. Protection Agency, Chamblee, GA). **Paraquat poisoning.** *J. Amer. Med. Ass. 223(6): 692-693; 1973.*

Useful information on paraquat for the physician is given in a Letter-to-the-Editor. Paraquat, used mostly for weed control, defoliation and desiccation of cotton, and killing potato vines, had caused a known 124 deaths worldwide up to 1971. Immediate effects of severe poisoning are vomiting, abdominal discomfort, and burning of the mouth and throat, followed by renal and hepatic failure. Later, progressive fibrosis and proliferation of alveolar epithelium occur in the lungs, leading sometimes to confusion with Hamman-Rich syndrome. The material is concentrated in the lungs and not readily eliminated from them. Fuller's earth, given within an hour of ingestion, can decrease absorption from the gastro-intestinal tract. Oxygen should not be given since it can reactivate paraquat and hasten death. Nose bleeds, eye injuries, and fingernail and skin injuries have been reported. More information is needed, particularly in terms of lung function, on the patients who have recovered from acute paraquat poisoning. Also not well established are the effects of long-term, low-level exposure to the herbicide.

73-1099. Mijatovic, M. (Yugoslavian Aviation Med. Cent., Belgrade, Yugoslavia). **Rad sa pesticidima i morbiditet radnika poljoprivredne avijacije. [Occupational contact with pesticides and morbidity in agricultural aviation workers.]** *Jugoslov. Inost. Dok. Zast. Radu 7(5/6): 100-106; 1971.* (Serbocroatian)

Agricultural aviation workers (51 pilots, technicians, and mechanics) 41-50 years of age were examined, six months after completion of work with organophosphate pesticides for possible occupational disease. At the time of the examinations, the workers were in contact with fertilizers only. The overall working conditions, including safety precautions, and the nutritional status of the workers were substandard. Pesticide exposure had continued for more than 10 years in 42% of the pilots and 29% of the technicians. Four of the workers reported digestive disorders; three respiratory difficulties; four locomotor disturbances; one subject each reported neurologic disorders, cardiovascular abnormalities, fatigue and headache. No symptoms were reported by 37 of the workers; 42 reported occasional excessive alcohol consumption; and 28 were smokers. Respiratory disorders were more common among the technicians than the pilots; however, a high percentage of the pilots had anemia, apparently due to poor nutrition rather than to pesticide exposure. Abnormalities in liver function tests were attributed to alcohol consumption. The routine safety precautions were concluded as adequate for prevention of occupational pesticide poisoning.

73-1100. Harrison, L. C.; Dortimer, A. C.; Murphy, K. J. (Princess Alexandra Hospital, Woolloongabba, Q. 4102, Brisbane, Australia). **Fatalities due to the weedkiller paraquat.** *Med. J. Aust. 2(14): 774-779; 1972.* (19 references)

Two cases of paraquat poisoning which illustrate the different types of toxicity of this substance are presented. In the first patient, who purposely ingested several hundred ml of Gramoxone, death was caused by intractable peripheral circulatory failure within 36 hr. The second patient exhibited the usual progression of poisoning through reversible renal insufficiency and pulmonary fibrosis to death from respiratory failure following accidental ingestion of about 30 ml of 20% paraquat solution. The patient lived for 23 days, the longest period of survival known in a patient with paraquat-induced lung proliferation. In future cases, it may be of use to look for disseminated intravascular coagulation and to administer heparin early if coagulation appears, to use cytotoxic agents, and to avoid using oxygen if possible.

73-1101. Ganley, P. M.; Porteus, B. D. (700 Bishop St., Honolulu, HI). **Mercury poisoning and medical proof.** *Med. Trial Tech. Quart. 18(4): 374-406; 1972.*

Widespread disintegration of brain cells, particularly in the area controlling coordination and visual perception, is characteristic of mercury poisoning. In Iraq hundreds of cases of poisoning, with many deaths, were reported due to consumption of homemade bread made from grain dressed with ethyl mercury toluene sulfonamide. Disturbance of speech, cerebellar ataxia, and spasticity were the major symptoms, and kidneys, heart, skin, gastrointestinal tract, and muscles were affected in addition to the nervous system. In New Mexico a number of children suffered permanent brain damage as a result of eating meat from a hog fed mercury-treated seed. Fetal tissue may be quite sensitive to and accumulate mercury in amounts greater than would be expected from levels in the mother. Treatment is generally symptomatic and often unsuccessful. Diagnosis is difficult, especially in cases with minimal initial symptoms. The Porteus Maze Test for intelligence may be a useful diagnostic tool for detecting organic brain damage. Combining newly developed or refined histological and chemical examinations with this test can offer medical proof of the degree of injury from mercury poisoning.

73-1102. Bubien, Z. (Inst. of Physiol. Sci., Vet. Dept. WSR, Wroclaw, Poland.) **Zatrucia zwierzat insektycydami fosfoorganicznymi. [Poisoning of animals with organophosphate insecticides.]** *Med. Wet. 27(10): 611-612; 1971.* (14 references) (Polish)

Between 1961-1970 organophosphate insecticide poisoning was determined in bees (30 times), poultry and wild birds (27 times), and large domestic animals (8 times). Mass poisoning of bees was due to methyl parathion or fenitrothion applied incorrectly to plants on windy days and without notification to bee keepers. Death of fowl, pigeons, sparrows, and crows most frequently resulted from intentional and malicious poisoning with methyl demeton or thiometon. The following amounts were isolated from contents of the crop (chickens): 1480 ppm methyl demeton, 210 ppm thiometon, 1090 ppm azinphosmethyl; from stomachs: 490 ppm methyl demeton (chicken), 770 ppm thiometon (pig). Intoxication of large animals (cows, pigs, horses, cats) was usually subacute resulting in recovery after several days of illness.

73-1103. Okada, H.; Kamata, T.; Nakagawa, A.; Hirakawa, S. (National Sanatoria Hiroshima Hospital, Hiroshima, Japan). **[A case of acute intoxication due to paraquat-dichloride.]** *Nippon Kyobu Shikkan Gakkai Zasshi (Jap. J. Thorac. Dis.) 10(12): 673; 1972.* (Japanese)

A 44-year-old man swallowed 15 ml of Gramoxone (24% paraquat solution) herbicide by mistake. Symptoms on the second day were slight fever, poor appetite, and difficulty in swallowing. On the third day glycosuria, proteinuria, and oliguria developed. Jaundice and dyspnea appeared by the fifth day with decreased blood oxygen and carbon dioxide levels. Blood urea nitrogen also gradually increased to 120 mg/dl. Kidney and liver function returned to normal after symptomatic treatment. However, dyspnea became more and more severe and the patient died on the 20th day. Autopsy revealed extensive and severe fibrosis of the lung. This is the second reported case of Gramoxone intoxication in Japan, and the manufacturer could not suggest an antidote. A literature search revealed that a quaternary ammonium hypotensive drug caused fibrosis of the lung; however, the clinical course was different from that in the present case.

73-1104. Wakatsuki, S.; Matsushima, S.; Araki, S.; Tsutsui, J.; Shirai, I.; Takamatsu, M. (Saku Gen. Hosp., Usuda, Nagano Prefect., Japan). **[Studies on the actual nature of the so-called greenhouse disease syndrome and its prevention.]** *Nippon Noson Igakkai Zasshi (Jap. J. Rural Med.) 21(4): 399-413; 1973.* (1 reference) (Japanese)

Health examinations were performed on 900 farm employees working in plastic greenhouses in five Japanese districts in 1970 and 1971 and the results compared with those from a similar group of ordinary field workers. Not all of the greenhouses had ventilation stacks. Pesticides were applied 10-40 times a year and consisted mainly of organosulfur fungicides such as dithane, organophosphate insecticides such as estox, and acaricides. The greenhouse employees had, on the average, longer working days than the ordinary farmworkers, especially in the case of the women, and they slept fewer hours each night. Many greenhouse workers, especially the women, complained of symptoms such as cramped shoulders, low back pain, dizziness, and insomnia. These symptoms coincide with those designated by other authors as "greenhouse disease," attributed to a combination of poor working conditions and pesticide exposure. Some instances of low serum cholinesterase activity and hepatic function abnormalities were found. Improving the ventilation of the greenhouses and modifying pesticide application methods may alleviate the symptoms.

73-1105. Talekar, N. S. (Univ. of Wisconsin, Madison, WI). **DDT and reproduction in birds.** *Pesticides 5(5): 11-20; 1971.* (84 references)

Evidence for and against the implication of DDT and other organochlorine insecticides in reproductive failures of birds is reviewed. Reproductive failures have been noted in many bird species in the United States and western Europe. In some cases, a chronological coincidence existed between the initiation of large-scale organochlorine use and the decreases in reproductive

success. Relatively high levels of organochlorines were found in damaged eggs of some birds. This evidence contrasts with findings from early laboratory studies in which the feeding of even very large amounts of organochlorines to birds was not uniformly followed by impairment of reproduction. Later studies revealed that a gradual decline in eggshell thickness occurs with prolonged treatment. Hypotheses on the mechanism of interference with reproduction by organochlorines are under investigation, but studies have failed to point to carbonic anhydrase inhibition, enhanced steroid degradation, or impaired vitamin D metabolism as the definitive cause-effect link. Age, disease, nutrition, and environmental factors such as temperature and noise level can affect eggshell thickness. Wildlife declines in India appear to be due to disruption of habitat, and in view of the public health importance of DDT, it seems advisable to continue DDT use while searching for a replacement.

73-1106. Fachmann, I.; Gokhale, M. S. (Delicia India Ltd., India). **Aluminum phosphide "Phosfume" a versatile fumigant.** *Pesticides 6 (10): 22-23; 1972.* (2 references)

Aluminum phosphide offers a number of advantages as a fumigant in India. Gradual decomposition of aluminum phosphide tablets and release of phosphine facilitate gradual distribution of a pre-determined dosage while affording maximum safety to operators. The fumigant does not affect germination of the seeds or baking quality of the flour. Cereal products as well as all kinds of pulses, dried fruit, and milk powder can be fumigated, but not green plants or fresh fruits and vegetables. PH_3 is highly toxic, but poisoning is rare and generally due to careless handling. It is not absorbed percutaneously. Precautions to be taken during fumigation include: opening the tin in open air immediately prior to use; use of whole tins; destruction of packing material; thorough cleansing of areas of the body exposed to the tablets or dust; storage of tins in locked, cool, ventilated areas away from sunlight; extinguishing of fires nearby with carbon dioxide rather than water; and removal of all persons from areas during and at least four hours after fumigation.

73-1107. Barnes, J. M. (MRC Toxicol. Unit, Woodmansterne Road, Carshalton, Surrey, England). **Toxic hazards associated with the use of insecticides for the control of mosquitoes inside houses.** *Pestic. Sci. 3(4): 499-502; 1972.* (12 references)

The use of persistent insecticides on the walls of houses was the final blow in interruption of the malaria transmission cycle. DDT was successfully used in this manner for more than 15 years, while dieldrin was applied indoors despite its considerably greater dermal toxicity. The specific instructions for use and safety precautions supplied with new organophosphate insecticides when vector resistance to organochlorine resistance developed were often disregarded. Cholinesterase depression as well as toxic symptoms were recorded among spraymen and residents. If affected workers stopped working as soon as symptoms of carbamate intoxication appeared, the symptoms disappeared rapidly, so the effects of carbamate overexposure were judged self-limiting. Several automatic dispensing devices not requiring pesticide contact by spraymen lacked efficacy. Many years of DDT use have produced complacency among spraymen regarding safety precautions. Organophosphates have the advantage of having unpleasant odors, making them detectable. Only careful evaluation in progressively more extensive field trials will reveal which pesticides are safe to use.

73-1108. Anonymous. **La prevention des intoxications lors de la mise en oeuvre des pesticides. [Prevention of occupational poisonings by pesticides.]** *Phytoma 25 (244): 27-29; 1973.* (French)

Measures necessary to prevent occupational poisonings by pesticides are described. The application of pesticides, especially in spray form, is hazardous. Specifications concerning the necessary protective clothing, methods of application, maximum permissible exposure time, duration of hazardous pesticide concentrations after application, and poisoning symptoms and first-aid procedures should be determined for all pesticides. Occupational poisonings by pesticides are infrequent compared to accidental and intentional poisonings by pesticides and other agents. Cases of organophosphorus pesticide poisoning are more numerous than those with organochlorine preparations.

73-1109. Rayner, M. D.; Popper, J. S.; Carvalho, E. W.; Hurov, R. (Dept. Physiol., School Med., Univ. California, San Francisco, CA 94122). **Hyporeflexia in workers chronically exposed to organophosphate insecticides.** *Res. Commun. Chem. Pathol. Pharmacol. 4(3): 595-606; 1972.* (17 references)

Hyporeflexia was recorded in agricultural workers primarily exposed to organophosphate insecticides; a method which measures the isometric force generated following a standardized blow to the Achilles tendon was used. In preliminary studies conducted 3-4 days after spraying, a highly significant difference was observed between the reflex force in high organophosphate users and the values predicted on the basis of the control population. Reflex force 1-4 hr after spraying was also significantly greater than predicted from the control population. Conduction velocity and motor and sensory latencies were normal. No change in EMG spike potential amplitude from the adductor pollicis was observed when the ulnar nerve was stimulated at a frequency of 20 pulses/sec on the day after spraying; there no were signs of temporal dispersion observed after stimuli.

73-1110. Graev, M.; Cecere, U.; Froldi, R. (Inst. di Med. Legale e Delle Assicurazioni Dell'Universita di Macerata, Italy). **Illustrazione di 8 casi di polinevriti da ortotricresilfosato e sua dimostrazione chimica in un composto plastificante "celloresina" usato in conceria. [Description of 8 cases of tri-*o*-cresyl phosphate-induced polyneuritis and its chemical determination in a plastifier referred to as "celloresin" used in a tannery.]** *Riv. Infort. Mal. Prof. 58(1): 54-74; 1971.* (34 references) (Italian)

Eight cases of polyneuritis from occupational exposure (leather treatment) to tri-*o*-cresyl phosphate (TOCP) are presented. The first clinical symptoms including digestive disorders, paresthesia, and cramps and formication in the limbs developed within three months of exposure to this agent in five cases and within one year of exposure in two cases. Severe asthenia of the thigh and leg muscles and subsequent paralysis of the lower limbs occurred two months after the onset of the first clinical symptoms. A 25% permanent disability status was established in three cases and of 30% in two other cases. The eighth case developed the first symptoms of the disease three years after handling a preparation referred to as celloresin and used in the shoe industry for leather refining purposes. Gas and thin-layer chromatography of this material indicated TOCP levels ranging from 1.01 to 3.41%. The MAC of 5%, established by the occupational safety authorities in Italy, for TOCP should be lowered to 2%, and gloves should worn while handling this compound.

73-1111. Tarashchuk, V. V.; Laptev, Z. L. (Author address not given). **Izmeneniya v zheludochno-kishechnom trakte i pecheni pri ostrom otravlenii nekotorymi fosfororganicheskimi pestitsidami. [Changes in the gastrointestinal tract and the liver due to acute poisoning with some organophosphorus pesticides.]** *Sb. Tr. Sud. Med. Sud. Khim. Mater. Soveshch. 3: 455-456; 1969.* (Russian)

Successfully treated cases of acute methyl mercaptophos, demeton, and methyl demeton poisoning and one fatal acute trichlorfon poisoning were compared with experimental demeton poisoning in white rats with regard to changes occurring in the gastrointestinal tract and the liver. Nausea, vomiting, upper and lower abdominal pain, and liquid feces were the major symptoms of poisoning with such pesticides in man. Redness of the gastric and duodenal mucosa, congestion of the gastric wall and of the gastric and duodenal submucosa, and focal gastric hemorrhages were found during autopsy in the patient who died of trichlorfon poisoning. Symptoms of toxic hepatitis (yellowish, congested liver with focal necrosis, vacuolation of the cytoplasm, cells with hyperchromic, pyknotic nuclei, and lymphoid infiltration of the stroma) were present. Rats fed 50 or 100 mg of methyl demeton per kg body weight developed motor depression, lachrymation, sialorrhea, tremor, muscular fasciculations, and severe anorexia within 30 min after administration. Rats fed 100 mg/kg died within two hours. The methyl demeton induced changes in the gastrointestinal tract and in the liver were similar to those produced by trichlorfon in man.

73-1112. Vrochinskiy, K. K. (Ukrainian Sci. Res. Inst. Sci. Technol. Inform. Technico-Economic Res., Kiev, USSR). **Okhrana otkrytykh vodoyemov i podzemnykh vod ot zagryazneniya pestitsidami. [Protection of water reservoirs and ground water from pesticide contamination.]** *Ukrainian Scientific Research Institute of Technology, Science Information and Technico-Economic Research, Kiev, 1971, 65 pp.* (32 references) (Russian)

Ways of penetration of pesticides into surface water bodies and ground water and possibilities for controlling pesticide contamination of such waters are reviewed. Pesticides, especially organochlorine compounds, are hazardous to aquatic life since they tend to accumulate and are highly persistent in water. The process of pesticide accumulation in the ecological chain is particularly intensive in the last stages when substantial pesticide intakes by man result. Limiting criteria (hygienic-toxicological and organoleptic) as well as maximum allowable concentrations in water of 54 pesticides are listed.

73-1113. Mirakhmedov, U. M.; Karimov, A. M. (Kafedra Kozhko-Venericheskikh Bolezney, Tashkent Med. Inst., Tashkent, USSR). **Vliyaniye pestitsidov na kozhu rabotnikov sel'skogo khozyaystva. [The effect of pesticides on the skin of agricultural workers.]** *Vestn. Dermatol. Venerol. 46(7): 50-52; 1972.* (8 references) (Russian)

The skin sensitivity and the incidence of dermatitis in agricultural workers having occupational contact with DDT and BHC were studied. Sensitization to DDT in 9 and to BHC in 12 out of 300 normal cotton growers was determined. An investigation of 112 patients who have been in contact with DDT and BHC for varying durations revealed 78 cases of acute dermatitis, 7 cases of subacute dermatitis, 10 cases of acute eczema, 15 cases of subacute eczema, and 2 cases of toxicoderma. The focal lesions were localized predominantly in the face, neck, chest, and hands. The affections were seasonal. Exacerbation of the skin process in the form of focal reactions after the application of the pesticides was observed. Both DDT and BHC, applied to the skin in a concentration of 3-5%, exerted skin sensitizing effect in 38 and 47 out of the 112 cases.

73-1114. Anonymous. **Touching up the paraquat picture.** *Food Cosmet. Toxicol. 10(5): 700-705; 1972.* (28 references)

Recent findings concerning paraquat toxicity are reviewed; where possible, findings in human poisoning cases are correlated with animal studies. The greatest

threat to human health comes from liquid paraquat concentrations (> 20%). Removal of paraquat from the circulation by forced diuresis, hemodialysis, peritoneal dialysis, and exchange transfusions allowed recovery in some cases; forced diuresis seems most effective. Further absorption from the intestinal tract is prevented by prompt gastric lavage, catharsis, and administration of adsorbents such as sterilized Fuller's Earth. Rapid urine tests have been developed to determine the need for vigorous treatment. Continuing studies of the mechanism of pulmonary response to paraquat revealed that paraquat itself, and not a metabolite, was responsible for pulmonary fibrosis. A free radical is formed from paraquat in the presence of reducing substances, followed by peroxide formation and peroxidation of cell-membrane lipids. Well-oxygenated cells are particularly susceptible to this disturbance, so that oxygen treatment of paraquat poisoning is potentially harmful. Other toxic effects of paraquat include nail damage and adrenal cortex necrosis. Induction of smooth endoplasmic reticulum and development of lipidic lamellate cytosomes were seen in proximal renal tubules of mice given 200 ppm paraquat in drinking water.

See also **73-1050** **73-1170** **73-1175**

73-1115. Kolberg, J.; Helgeland, K.; Jonsen, J. (Dept. Microbiol., Dental Faculty, Univ. Oslo, Oslo, Norway). **The herbicide 2,4-dichlorophenoxyacetic acid II: triglyceride accumulation in L cells.** *Acta Pharmacol. Toxicol. 31(5-7): 481-487; 1972.* (18 references)

Chemical analysis indicated that mouse fibroblast cells (L 929) treated with 500 μg 2,4-D/ml for 24 hr contained about twice the amount of lipids as the control cells, primarily in the triglyceride fraction. ^{3}H-palmitate incorporation increased about three times following 2,4-D treatment. Since the specific activities of triglycerides of control and treated cells were similar, the fatty acids were probably accumulated from the medium. About three quarters of the increased incorporation of ^{3}H into triglycerides was found in the lipid particles isolated from disrupted cells, suggesting that the majority of the accumulated triglycerides was confined to the observed cytoplasmic particles. An increase in incorporation of ^{14}C from ^{14}C-acetate also occurred after exposure to 2,4-D. The specific activity of the ^{14}C label in the triglyceride fraction from treated cells was about one quarter that in control cells, indicating some increased endogenous synthesis of fatty acids. The greater incorporation of both ^{3}H-palmitate and ^{14}C-acetate observed in treated cells suggests that 2,4-D may affect permeability of the plasma membrane.

73-1116. Uesugi, Y.; Tomizawa, C. (Nat. Inst. of Agr. Sci., Kita, Tokyo, Japan). **Metabolism of *O*-ethyl *S,S*-diphenyl phosphorodithioate (Hinosan) by mycelial cells of *Pyricularia oryzae*.** *Agr. Biol. Chem. 35(6): 941-949; 1971.*

Metabolism of the organophosphorus fungicide Hinosan (*O*-ethyl *S,S*-diphenyl phosphorodithioate) by mycelia of *P. oryzae*, rice blast fungus, was studied using ^{32}P-, ^{35}S- and non-labeled compounds, by ion exchange chromatography, paper chromatography, thin-layer chromatography and gas chromatography, and identifying the metabolites and their derivatives with authentic compounds. The main metabolic pathway is hydrolysis of one P-S linkage followed by the other P-S linkage or ethyl ester linkage and finally yielding phosphoric acid. A part of the fungicide metabolizes to hydroxylated intermediate metabolite, *O*-ethyl *S*-*p*-hydroxyphenyl *S*-phenyl phosphorodithioate. No significant difference in rate and mode of metabolism was found in this experiment between susceptible and resistant clones against the fungicide. (Author abstract by permission)

73-1117. Baetjer, A. M. (Dept. of Environ. Med., Johns Hopkins Univ., Sch. of Hyg. and Pub. Health, Baltimore, MD 21205). **Dehydration and susceptibility to toxic chemicals.** *Arch. Environ. Health 26(2): 61-63; 1973.* (10 references)

Deprivation of water for 48 hours increased mortality of rats and mice injected with water soluble compounds of lead, antimony, and methacholine chloride but did not greatly alter susceptibility to lipid soluble trichloroethylene, benzene, and parathion. The brain appeared resistant to prolonged dehydration when tested by the hypothalamic self-stimulation method. Cilia-mucus clearance in chick trachea and the number of free alveolar macrophages recoverable from rat lungs were reduced by 24 to 48 hour water deprivation. In vitro metabolism of hexobarbital by liver microsomal enzymes was affected by water and food deprivation. These animal experiments suggest that dehydration may alter the susceptibility of man to toxic foreign chemicals. (Author abstract by permission)

73-1118. Vartic, N.; Jacob-Giurgea, R.; Ivascu, V. (Inst. fuer Parasitol., Tieraerztliche Hochschule Cluj, Cluj, Rumania). **Schwankungen einiger Stoffwechselindikatoren beim Huhn nach Verabreichung von Bubulin. [Changes in some metabolic indicators in chicken after administration of Bubulin.]** *Arch. Exp. Veterinaermed. 26(2): 206-214; 1972.* (11 references) (German)

The effect of a single i.m. 0.1 ml dose of Bubulin (a preparation containing trichlorfon, pralidoxime, and atropine) on some metabolic parameters was studied in chickens. The total protein content in the liver increased immediately after injection and remained elevated over 24 hr, normalizing by the 72nd hour. The free amino acid content of the liver was below normal during the first 24 hr and exceeded control values by 50% at the 72nd hour. Although the hepatic GOT activity increased, the GPT activity was unchanged. Hepatic glycogen content decreased and hepatic tissue respiration increased during the first hours after injection, returning to normal in a few hours. Although the adrenal ascorbic acid content showed little change during the first hours, it later decreased and remained below normal throughout the 72 hour observation. A slight increase in the blood cholesterol level during the first hours was followed by a drop to below normal.

73-1119. Awad, O. (Faculty of Sci., Dept. of Chem., Alexandria Univ., Alexandria, Egypt). **Relationship between acetylcholine and cholinesterase activity in the brain following organophosphorus cholinesterase inhibitors.** *Arzneim. Forsch. 22(11): 1926-1927; 1972.* (14 references)

The intraperitoneal administration of malathion, EPN, and eserine to nonanesthetized rats decreased ChE activity and increased brain ACh. The results reported as well as others previously published suggest that the increase in ACh was partly due to factors other than ChE inhibition, such as its biosynthesis. Malathion at 200 mg/kg caused a 50% inhibition of ChE and a 51% increase in brain ACh. However, eserine at 1 mg/kg produced an 85% increase in ACh while ChE activity was inhibited 58%. EPN caused a 100% increase in ACh at

the level of 50% ChE inhibition (6 mg/kg). In each of the above cases 2 out of 10 animals died.

73-1120. Prokic-Immel, R.; Adlung, K. G. (Celamerck Gmbh & Co., Ingelheim, Germany). **Zur biologischen Wirkung zweier neuer Phosphorsaeureester des 2,5-Dichlor-methyl-thiophenols, CELA S 2957 und CELA K 673. [On the biological action of CELA S 2957, *O*-(2,5-dichloro-4-(methylthio)-phenyl)-*O,O*-diethyl-phosphorothioate and CELA K 673, *O*-(2,5-dichloro-4-(methylthio)-phenyl)-*O*-ethyl-methylphosphorothioate.]** *Anz. Schaedlingsk. Pflanzenschutz 45(11): 166-169; 1972.* (3 references) (German)

The biological action of the wide-spectrum acaricides and insecticides CELA S 2957 (*O*-(2,5-dichloro-4-(methylthio)-phenyl)-*O,O*-diethyl-phosphorothioate) and CELA K 673 (*O*-(2,5-dichloro-4-(methylthio)-phenyl-*O*-ethyl-methylphosphorothioate) were studied in greenhouse and field tests under moderate climate. The oral LD50 of S 2957 in rats and mice is 13 and 141 mg/kg. The corresponding values for K 673 are 27 and 46 mg/kg. The S 2957 residue content in apples, plums, and tomatoes varied from 0.2 to 0.5 mg/kg seven days after application. No traces of S 2957, or residue levels up to 0.02 ppm were found on cabbage and sugar beet leaves on the seventh day following application. No phytotoxicity of S 2957 or K 673 was observed.

73-1121. Pepperell, J. G. (School of Biol. Sci., Univ. of Sydney, N.S.W. 2006, Australia). **Effects of *p,p'*-DDT on the domestic hen.** *Aust. J. Zool. 20: 301-313; 1972.* (38 references)

Domestic hens were given *p,p'*-DDT every two days in capsules of 3, 30, and 150 mg. Mortality results suggest that all the doses of DDT were well below the lethal chronic dose for that insecticide. Egg production was not affected, but levels of DDT reached in eggs (79.0 ppm) and in adult body fat (47.9 ppm) were low relative to amounts associated with decreased egg production in other species. Significant numbers of embryos died both early and late in development in eggs produced by hens given the dose of DDT corresponding to 500 ppm in the diet. Survival of chicks and thickness of eggshells were not affected by feeding DDT to the hens.

73-1122. Hashimoto, Y.; Fukami, J. (Agr. Chem. Inspection Station, Kodaira, Tokyo, Japan). **Toxicity of orally and topically applied pesticide ingredients to carp, *Cyprinus carpio* Linne.** *Bochu Kagaku (Sci. Pest Contr.) 34(2): 63-66; 1969.* (7 references)

The toxicity of 31 pesticides to *Cyprinus carpio* Linne was measured after oral, topical, or the usual contact administration. TLm values in the contact method were converted to LD50 values for comparison, assuming that all of the pesticide in the 10 liter glass container was completely accepted by the fish (although it was not). Oral LD50 values ranged from 0.065 mg/fish (endrin) to > 10 mg/fish (a majority of compounds). In general, the pesticides showed lower toxicity when applied orally than by the contact or topical method. The insecticides had a positive correlation between oral and contact LD50s while most fungicides and herbicides were only measurably toxic by the contact route. Further studies to elucidate the modes of action are suggested.

73-1123. Yasuda, M. (Dept. of Anatomy, Kyoto Prefectural Univ. of Med., Kyoto, Japan). **Teratologic evaluation of Tsumacide (*m*-tolyl-*N*-methylcarbamate) in the rat.** *Bochu Kagaku (Sci. Pest Contr.) 37: 161-165; 1972.* (6 references)

Tsumacide (MTMC) was administered to rats at dietary levels of 80 to just below the maximum nontoxic dose of 4000 ppm from day 8 to 21 of pregnancy. Weight gain was slightly less at the highest dose; however, after the dosing period, weight gain in this group exceeded that in controls. Litter size, fetal mortality, and fetal weight were not affected by the insecticide. The incidence of malformations did not appear to be insecticide related. No abnormalities in the external differentiation, auditory function, and behavior were observed in the young at weaning. Tsumacide would probably not affect human embryonic development; levels ingested by man in the food are about 300,000 times greater than the highest dose administered in this investigation.

73-1124. Taljaard, J. J. F.; Shanley, B. C.; Deppe, W. M.; Joubert, S. M. (Dept. of Chem. Pathol., Faculty Med., Univ. Natal, Durban, S. Africa). **Porphyrin metabolism in experimental hepatic siderosis in the rat. II. Combined effect of iron overload and hexachlorobenzene.** *Brit. J. Haematol. 23(4): 513-519; 1972.* (20 references)

The combined effect of a known porphyrinogenic agent, hexachlorobenzene (HCB), and an iron overload was investigated in the rat. Minor tremors, loss of hair, encrusted hemorrhagic sores, and hepatomegaly resulted from feeding diet containing 0.3% hexachlorobenzene. No substantial increase in urinary excretion of porphyrin occurred with up to 33 days of administration. At this time the iron/dextran treated animals exhibited a sudden rise in output of uroporphyrin and coproporphyrin. At 60 days the mean excretion rates were 390 μg/rat/day (URO) and 134 μg/rat/day (COPRO). Significant porphyria was not seen until the 46th day in dextran treated animals and until the 55th day in the untreated HCB group and the maximum URO excretion in these rats was half that of the iron treated ones. Porphyrin accumulation in the liver occurred earlier and more rapidly in Fe/HCB animals than in the other groups, and only 8- and 7-carboxyl porphyrins were observed. Prior to the accumulation of porphyrin, degenerative changes

in the centrilobar zones of the liver nodules were observed in all groups. Liver ALA synthesis increased at an earlier time in Fe/HCB animals.

73-1125. Tomkins, D. J.; Grant, W. F. (Genetics Lab., Macdonald Campus of McGill Univ., St. Anne de Bellevue, Quebec, Canada). **Comparative cytological effects of the pesticides menazon, metobromuron and tetrachloroisophthalonitrile in *Hordeum* and *Tradescantia*.** *Can. J. Genet. Cytol. 14(2): 245-256; 1972.* (27 references)

Of the three pesticides tested in barley, only metobromuron had significant effects. Pretreatment of *Hordeum vulgare* seeds with tetrachloroisophthalonitrile (chlorothalonil) had no significant effect on germination, seedling height, or frequency of chromosomal aberration in the root tip. Menazon had a slight inhibitory effect on germination, but no effect on seedling height or chromosomal aberrations. Metobromuron markedly inhibited germination even after a 6-hr exposure, and the response was linear for dosage and duration of exposure. At 1500 ppm it reduced the seedling height from 7.4 cm to 3.2 cm. No effect was observed on chromosomes. Both X-rays and ethylmethanesulfonate (EMS) had pronounced cytological effects, but X-rays produced no significant changes in germinability or seedling height and EMS had a significant effect on both. EMS, but none of the herbicides, affected somatic mutations in inflorescences of *Tradescantia* clone 02. Metobromuron evidently had a severe physiological action rather than a cytogenic action like that of X-rays or EMS.

73-1126. Clement, J. G.; Okey, A. B. (Dept. of Biol., Univ. of Windsor, Windsor, Ontario, Canada). **Estrogenic and anti-estrogenic effects of DDT administered in the diet to immature female rats.** *Can. J. Physiol. Pharmacol. 50(10): 971-975; 1972.* (22 references)

Orally administered *o,p'*-DDT has estrogenic effects on the uterus of immature rats; stimulation of uterine growth is significant, however, only at doses at or above 1000 ppm *o,p'*-DDT in the diet. At lower doses (100 ppm) both *o,p'*-DDT and *p,p'*-DDT reduced the estrogenic response to injected estradiol-17β, probably by stimulating hepatic degradation of the steroid. (Author abstract by permission)

73-1127. Rossner, P.; Cinatl, J.; Bencko, V. (Inst. Hyg. Epidemiol., Prague 10, Czechoslovakia). **Ucinek petimocneho arsenu na bunecne kultury. [Effect of sodium arsenate on cell cultures.]** *Cesk. Hyg. 17(2/3): 58-63; 1972.* (10 references) (Czech)

The effect of pentavalent arsenic in the form of sodium arsenate at concentrations of $10^{-4}M$ to $10^{-9}M$ on the growth and morphology of LEP cells cultivated in an EPL medium was studied. At concentrations of $10^{-5}M$ to $10^{-7}M$ arsenate exerted a short-lived stimulating effect on cell growth curves. The two lowest concentrations did not produce stimulation until after a prolonged lag phase (cell adaptation), with a marked growth increase noticeable at the end of cultivation. At arsenate concentrations of $10^{-5}M$ to $10^{-9}M$ cell population doubled in 38-76 hours (control 55 hours). The lowest concentration of arsenate induced the greatest number of mitoses between the 4th and 7th day. At $10^{-8}M$ on the 7th day of cultivation mitotic activity was two and a half times that of control cell activity. The number of cells containing one nucleolus in the nucleus increased with increasing concentration. The number of polyploid cells increased with cultivation time and with decreasing concentration.

73-1128. Kupfer, D.; Levin, E.; Burstein, S. H. (The Worcester Foundation Exp. Biol., Shrewsbury, MA 01545). **Studies on the effects of Δ^1-tetrahydrocannabinol (Δ^1-THC) and DDT on the hepatic microsomal metabolism of the Δ^1-THC and other compounds in the rat.** *Chem. Biol. Interactions 6(1): 59-66; 1973.* (24 references)

The effect of technical DDT on the hepatic microsomal monooxygenase system in rats was studied for comparative purposes along with the effects of Δ^1-tetrahydrocannabinol (Δ^1-THC) and a marihuana extract containing 25% Δ^1-THC. Administration of DDT at 25 mg/kg/day for three days increased liver weight and the microsomal metabolism of Δ^1-THC by 50%, indicating the potential inducibility of Δ^1-THC transformation. In no experiment did Δ^1-THC enhance its own metabolism or that of aminopyrine or PCMA.

73-1129. Adamson, R. H.; Guarino, A. M. (Lab. of Chem. Pharmacol., Nat. Cancer Inst., Nat. Inst. of Health and The Mount Desert Island Biol. Lab., Salisbury Cove, ME). **The effect of foreign compounds on elasmobranchs and the effect of elasmobranchs on foreign compounds.** *Comp. Biochem. Physiol. 42A: 171-182; 1972.* (35 references)

Work dealing with elasmobranchs and foreign compound interaction indicates that foreign substances generally exert effects on elasmobranchs qualitatively similar to those in mammals. Also elasmobranchs dispose of pesticides and other substances by mechanisms similar to those of mammals. The 24 hr bile/plasma ratio found for DDT in dogfish was 20:1. After i.a. or i.v. administration of ^{3}H or ^{14}C-DDT to dogfish, the radioactivity disappeared from the plasma rapidly, and only 1% was excreted through the gills during the first hour. Greater than 95% of the radioactivity was bound to plasma proteins, taken up by the liver, and excreted in the bile and urine, mainly as the parent compound.

73-1130. Lacassagne, A.; Jayle, M. F.; Hurst, L.; Desfosses, B. (Institut de Radium, Paris, France). **Influ-**

ence du pregnandiol et de l'allopregnandiol sur le processus de cancerisation du foie chez des rats males intoxiques par le para-dimethyl-aminoazobenzene (DAB). [Effect of pregnanediol and allopregnanediol on the hepatic cancerization process in male rats poisoned with para-dimethylaminoazobenzene (DAB).] *C. R. Acad. Sci. Paris Ser. D 274: 141-143; 1972.* (3 references) (French)

The effect of pregnanediol, allopregnanediol and a combination of pregnenolone with *o,p'*-DDD (TDE) on hepatic cancer development and testicular degeneration was studied in male Wistar rats fed 600 mg of para-dimethylaminoazobenzene per kg daily. The daily doses of pregnanediol alone prevented hepatic cancer development, as did the combination of pregnenolone and *o,p'*-DDD. Pregnenolone also prevented testicular degeneration due to *o,p'*-DDD. The mutual neutralization of the effects of pregnenolone and *o,p'*-DDD resulted in the absence of tumor formation in the testicular interstitial gland.

73-1131. Klee, G. E. (Michigan State Univ., East Lansing, MI). **DDT metabolism and movement in deciduous forest soil microarthropods.** *Diss. Abstr. Int. 32(9): 5233B; 1972.*

DDT was introduced indirectly into an invertebrate food chain by feeding large numbers of a resistant species of laboratory reared collembola, *Folsomia candida*, a brewer's yeast food spiked with 10^5 ppm *p,p'*-DDT, *o,p'*-DDT, or *p,p'*-DDE. After being fed uncontaminated yeast for 48 hr, the collembola were released into fenced forest plots and the arthropod fauna sampled periodically. The final detectable metabolite, regardless of the initial compound, was *p,p'*-DDE; only traces of this compound were present in many microarthropods four weeks after introduction of treated organisms. Dehydrochlorination of *o,p'*-DDT gave *o,p'*-DDE; reductive dechlorination resulted in *o,p'*-DDD (TDE). The major metabolic pathway in the microarthropods was in vivo isomerization of *o,p'*-DDT to *p,p'*-DDT, which was then dehydrochlorinated to *p,p'*-DDE. Metabolism to *p,p'*-DDD (TDE) early in the sampling period indicated some microbial breakdown. When *p,p'*-DDE was introduced, no other metabolites were found. Elimination of *p,p'*-DDE by collembola was practically complete within two weeks, whereas oribatid mites maintained a slowly decreasing low level for four weeks. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-8712)

73-1132. Marshall, R. S. (Cornell Univ., Ithaca, NY). **Aldrin epoxidation by non-enzymatic systems and its inhibition by insecticide synergists.** *Diss. Abstr. Int. 32(9): 5233B; 1972.*

The effects of insecticide synergists and other microsomal mixed-function oxidation inhibitors on several non-enzymatic free-radical generating systems were investigated. Aldrin epoxidation was inhibited by Fenton's reagent modified by addition of bovine serum albumin as well as a series of substituted 1,3-benzodioxoles, 1,2,3-benzothiadiazoles, and other compounds with synergistic activity. The inhibitory potency of these compounds is statistically correlated with the rate of interaction with the radicals generated by the model system, apparently due to competition for a common radical species. The products of reaction of some of the inhibitors with Fenton's system were identified by gas-liquid and thin-layer chromatography; in the case of 5-nitro-1,2-benzodioxole, the major product was 4-nitrocatechol. Aldrin epoxidation was also effected by a peracetic acid system and to a much smaller degree by the Udenfriend and Ullrich systems, which are considered to produce the $O_2H \cdot$ radical. The synergists did not interact to inhibit epoxidation by these systems and did not undergo reaction themselves. If radicals similar to the OH · radical are involved in microsomal oxidation at P-450, it is possible that part of the inhibitory activity of insecticide synergists is due to their reactivity with this radical. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-8967)

73-1133. Poonacha, K. B. (Univ. of Wisconsin, Madison, WI). **Studies of genetic resistance to DDT and effects of environmental stress in the Japanese quail (*Coturnix coturnix* japonica) fed a diet containing DDT.** *Diss. Abstr. Int. (Part 1) 32(12): 6851B-6852B; 1972.*

DDT-resistant quails were bred by feeding a diet containing 200 ppm DDT during the first 30 days of life. Resistance began to develop after the third generation of selection as evidenced by lower mortality among the selected lines fed DDT. Mortality was also reduced in the presence of partial starvation and low environmental temperatures. Females in resistant lines were less resistant than males, and there was some cross-resistance to lindane. Realized heritabilities were calculated and found to be 32 and 44% for two lines. In separate experiments, mortality in groups fed 100, 200, or 300 ppm in the diet was higher among partially starved quail than among fully fed quail. Maintaining the quail at 18.3°C rather than the normal room temperature of 24°C also increased mortality. In all experiments females had higher mortality rates. The higher mortality under adverse conditions was attributed to mobilization of DDT stored in body fat. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-13,993)

73-1134. Samuel, A. (Michigan State Univ., East Lansing, MI). **Effect of malathion on selected insect and mammalian tissue cultures.** *Diss. Abstr. Int. (Part 1) 32(12): 7093; 1972.*

The effect of malathion on cell cultures of insect

and mammalian origin was studied with regard to DNA, protein, and RNA syntheses and population increase. Insect cell groups in general showed twice as much resistance to malathion as the mammalian cell group. Cytopathological effects seemed to appear after the cells had undergone a certain degree of inhibition. Absence of malaoxon in the "malathion intoxicated" culture and the inability of malaoxon (up to 20 ppm) to produce any inhibitory effects indicated that "malathion" effect was not caused by malaoxon. Contribution to malathion toxicity by impurities was deemed insignificant, though possible contribution to toxicity by some metabolite was not eliminated. The first malathion induced biochemical lesion was suspected to have occurred in the protein synthetic process which in turn led to inhibition of DNA synthesis. High sensitivity of the cells to malathion with regard to mitotic arrest was noted. The mitotic arrest seemed to have occurred before the M phase. The net effect of the inhibitions led to premature "*aging*" of the cells and cell death. NAD enhanced the hydrolysis of malathion in cell cultures, probably by increasing carboxyesterase activity. NAD also enhanced DNA synthesis, probably because of the increased hydrolysis of malathion. The value of insect fat body cell cultures and primary embryonic cell cultures was evaluated by using cells obtained from house fly larvae. The fat body cells were not very useful for direct studies on cell division related processes. Embryonic cell cultures, as indicated especially by DDT metabolism, had significant value in pesticide resistance studies. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 72-16,507).

73-1135. Hemmett, Jr., R. B. (Rutgers Univ., New Brunswick, NJ). **The biodegradation kinetics of selected phenoxyacetic acid herbicides and phenols by aquatic microorganisms.** *Diss. Abstr. Int. (Part 1) 32(12): 7097; 1972.*

The degradation of 2,4-D and related compounds was investigated in model systems using activated sewage as a source of aquatic microorganisms. Both 2,4-D and its dimethylamine salt were rapidly degraded, as was 4-CPA. Microorganisms acclimated to 2,4-D oxidized the isopropyl and butyl esters of 2,4-D at about half the rate of the acid and also degraded 2,4-DCP. Adapted and non-adapted organisms were unable to degrade 3,4-dichlorophenoxyacetic acid (3,4-D), 2,4,5-T, 2(2,4,5-TP), the isooctyl ester of 2,4-D, MCPA, and 2-CPA. Although systems containing 3,4-DCP, MCP, and 3-M,4-CP showed large oxygen uptakes, chemical analysis revealed that the test compounds were not degraded. The degradation rates for the degradable compounds followed first-order kinetics at low concentrations, becoming zero-order at higher concentrations. The highest herbicide concentrations tested seemed to have some toxic effects on the microorganisms. The oxidation rate of 2,4-D increased by a factor of about 10 as the temperature rose from 10° to 25°C. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-17,846)

73-1136. May, J. R. (Univ. of Iowa, Iowa City, IA). **A study of the molecular interaction between the herbicide amiben and caffeine and its effect on physiological availability.** *Diss. Abstr. Int. (Part 1) 32(12): 7098; 1972.*

The herbicide amiben and caffeine were allowed to interact in aqueous buffer systems of pH 1.4-7.4. At the pH range of 1.4-3.4, the two species were shown to interact and precipitate from solution as an insoluble molecular complex. A 1:1 amiben-caffeine complex was isolated and its identity confirmed using ultraviolet spectrophotometric analysis and melting points. At pH 7.4 the two species were shown to interact forming a soluble complex with a stability constant of 34.8 $moles^{-1}$ liter. A relative potency factor of 1.15 ± 0.05 ($p<0.05$) calculated for a study using female albino rats showed that a 4:1 aqueous mixture of caffeine and amiben was significantly less toxic than caffeine alone. No deaths were produced by any of the dose levels of the complex. The results indicated that molecular complexation occurs in vivo within the stomach of the rat. A tracer study using caffeine-1-(methyl-^{14}C) showed that the amiben-caffeine complex was not dissociating completely within the gastrointestinal tract. When the labeled caffeine alone was administered orally to rats $60.7 \pm 1.8\%$ of the radioactivity was excreted in the urine and $4.1 \pm 0.0\%$ in the feces in a 48 hr period. In the case of the pre-complexed ^{14}C-caffeine, only $47.7 \pm 1.1\%$ ($p<0.05$) was excreted in the urine while that excreted in the feces increased to $13.9 < 3.5\%$ ($p<0.01$). (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-17,581)

73-1137. Pfaender, F. K. (Cornell Univ., Ithaca, NY). **Metabolism of DDT by axenic cultures and natural microbial communities.** *Diss. Abstr. Int. (Part 1) 32(12): 7195; 1972.*

The degradation of DDT (1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)ethane) by bacterial cultures and by natural microbial communities was studied. The initial breakdown of DDT to 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane (DDD) (TDE) appeared to be mediated by membrane-bound enzymes from a *Hydrogenomonas* sp. under anaerobic conditions. This membrane bound activity was stimulated by a soluble cell fraction and by flavin enzymes. Enzyme preparations from *Hydrogenomonas* sp., regardless of the media on which the cells were grown, could degrade DDT anaerobically to DDD, 1-chloro-2,2-bis (*p*-chlorophenyl)ethane (DDMS), dichlorobenzophenone (DBP) and several other products formed from DDT in small amounts. When freshly grown cells of this same organism were added to the anaerobically incubated extract and the mixture incubated aerobically *p*-chlorophenylacetic acid (PCPA)

was formed. Two organisms were isolated that grew using PCPA as a sole source of carbon. One of the organisms, *Arthrobacter* sp., produced *p*-chlorophenylglycolaldehyde during growth on PCPA. ^{14}C-DDT was added to a mixture containing fresh water + sediment and also to sewage. Over 99.9% of the counts could be extracted from samples of these natural communities as DDT and its nonpolar degradation products. The major products formed in both communities were DDD and DBP, but small amounts of DDMS, 2,2-bis(*p*-chlorophenyl)ethylene, and 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethylene were also formed. *p*-Chlorophenylacetic acid did not accumulate in the natural communities. DBP was added to sewage in two experiments. In one trial it was rapidly degraded, while in the other it was recovered unchanged. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-18,567)

73-1138. Sonawane, B. R. (Univ. of Missouri, Columbia, MO). **Metabolic studies of two carbanilate herbicides.** *Diss. Abstr. Int. 33(1): 52B; 1972.*

EP-475 (ethyl *m*-hydroxycarbanilate carbanilate) and phenmedipham (methyl *m*hydroxy-carbanilate *m*-methylcarbanilate) uniformly ring-labeled with ^{14}C in the *m*-aminophenol moiety were rapidly metabolized and eliminated after oral administration of rats. By 72 hours after treatment, 95.4% of EP-475 and 99.1% of phenmedipham administered had been recovered in urine and feces, primarily in hydrolyzed or conjugated form. The herbicides were first hydrolyzed to the hydroxyphenyl carbamates, which were then cleaved to *m*-aminophenol, which in turn was *N*-acetylated. The 3′-hydroxyacetanilide formed and the preceding intermediates were conjugated to glucuronides and ether sulfates. Subcellular rat liver homogenate fractions contained enzymes that catalyzed carbanilate degradation, primarily to hydroxyphenyl carbamates. Degradation was inhibited by DFP and carbaryl and did not require NADPH as a cofactor. Human, chicken, cow, and rat blood plasma similarly catalyzed the degradation. Photodecomposition at various wavelengths was minimal, producing hydroxyphenylcarbamates. Following the pathway previously described, alkaline soil rapidly decomposed phenmedipham to *m*-aminophenol, which was then adsorbed and complexed by soil components. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms. Order No. 72-19,249)

73-1139. Truhaut, R.; Fujita, M.; Lich, N. P.; Chaigneau, M. (Lab. de Toxicol. et d' Hyg. Indust., Univ. Rene-Descartes, Paris, France). **Etude des transformations metaboliques du zinebe (ethylenebisdithiocarbamate de zinc) chez la rat. [Study of metabolic transformations of zineb (zinc ethylene-bis-dithiocarbamate) in the rat.]** *C. R. Acad. Sci. Paris Ser. D 276(2): 229-233; 1973.* (15 references) (French)

The metabolism of zineb was studied in male and female Wistar rats. Doses of 1 g of a 20 g/100 ml-solution of zineb per kg body weight were introduced through a gastric tube 3 times a week over a 2-week-period. Carbon disulfide was detected in the exhaled air following zineb introduction by means of infrared spectrophotometry. Other sulfur-containing metabolites were detected in the urine by reaction with iodine in the presence of sodium azide. The principal metabolites found in the urine were identified as ethylene-bis-isothiocyanate and ethylene thiourea. The scheme of the metabolic degradation of zineb was identical with that observed by Lyman in zineb-treated plants.

73-1140. DuBois, K. P. (Dept. Pharmacol., Univ. Chicago, Chicago, IL). **The interaction of environmental chemicals with drugs.** *Drug Inform. J. 6(1): 53-58; 1972.* (15 references)

Relatively little work has been done on the effect of environmental chemicals on the activity of drugs. Initial interest in such effects was generated by the finding that malathion toxicity is markedly potentiated by simultaneous administration of EPN. Nearly all organophosphates, at concentrations lower than those required to inhibit ChE, inhibit non-specific esterases and amidases necessary for the detoxification of ester-type drugs. Folex, parathion, systox (demeton), and disulfoton are most active in this respect. The discovery that DDT and other organochlorines induce drug metabolizing enzymes has demonstrated the importance of interactions of environmental chemicals and drugs. The enzyme-inducing capacity of the substituted urea herbicides was discovered by measuring the effects of representatives of various classes of environmental chemicals and drugs on drug metabolism. Much more research of this type is needed.

73-1141. Desi, I.; Major, M. (Nat. Inst. Pub. Health, Budapest, Hungary). **Kis mennyisegu Lindan neurotoxikologiai hatasanak allatkiserletes vizsgalata. [Neurotoxic effect of small lindane doses in animal experiments.]** *Egeszsegtudomany 16(4): 313-323; 1972.* (23 references) (Hungarian)

The toxic effect of 2.5, 5, 10, and 50 mg/kg oral doses of lindane in Wistar rats was studied in subacute experiments. Tests of the functional status of the central nervous system (maze learning, Skinner box operational conditioning, and spontaneous orientation activity tests) indicate early, slight impairments of the central nervous system. However, histological investigations showed no changes in the brain, kidney, spleen, and liver. No significant difference was detected between test and control animals regarding bromsulphalein excretion. It is concluded that persons exposed to lindane should undergo neurological examinations for the detection of possible poisoning in its early, reversible stage.

73-1142. Koudela, S.; Cieleszky, V. (National Inst. Nutrition Sci., Budapest, Hungary). **A gyomirto es novekedesszabalyozo szerek felhaszanalasaval kapcsolatos elelmezesegeszsegugyi problemak. [Food hygienic problems involved in the use of herbicides and growth regulators.]** *Elelmiszervizsgalati Kozlem. 18(5-6): 243-255; 1972.* (46 references) (Hungarian)

Application, toxicology, and persistence of various herbicides and growth regulators are reviewed. The oral LD50 values of dinitrophenols, aliphatic acids, chlorinated phenoxyalkanoic acids and their derivatives, aromatic acids, chlormequat chloride (CCC), amides, carbamates, urea derivatives, dialkyl nitroanilines, dipyridyls, and triazines in rat are about 25, 3,000, 300-1,000, 400, 800, 1,000, 1,500, 1,000, 400, and 3,000 mg/kg. The corresponding residue limits in crops are 0.1 mg of dinitrophenol, chlorinated phenoxyalkanoic acid, amide, carbamate, dialkyl nitroaniline or triazine, 0.01 mg of aliphatic acid, 0.5 mg of chlormequat chloride or dipyridyl. The persistence of these products in the soil ranges from 0.2 to 10 months. Certain carbamates and chlormequat chloride are teratogenic and embryotoxic; amitrole and certain carbamates are carcinogenic; triazines are mutagenic. Dinitrophenols and chlorinated phenoxyalkanoic acid derivatives have cumulative properties. Dalapon causes pantothenic acid insufficiency in the organism. A combination of dichloropropionanilide with urea derivatives produces carcinogenic azobenzene derivatives in the soil which can find their way into humans via plants.

73-1143. Komissarenko, V. P.; Reznikov, A. G.; Turchin, I. S. (Inst. Endocrinol. Metabol., Kiev, USSR). **Cytologic and functional changes in the adrenal cell culture from a human fetus under the action of *o,p*-DDD. II. Study of corticosteroid production.** *Endocrinol. Exp. 5(4): 217-222; 1971.* (17 references)

The presence of *o,p*-DDD (TDE) (8 to 64 μg/ml) in the medium produced a slightly decreased cortisol production by a monolayer adrenal cell culture obtained from human fetus. When *o,p'*-DDD was added to a culture in which secretion had been stimulated with ACTH, cortisol production was markedly decreased. The presence of *o,p'*-DDD in the medium (16 μg/ml or more) completely suppressed the steroidogenic effect produced by addition of ACTH. Marked degenerative changes in the cells were observed along with these changes in cortisol production at doses above 8 μg/ml, but at that dose cortisol production decreased by 50% and no visible morphologic changes were seen. The direct influence of the compound supports the view that extra-adrenal metabolism of *o,p'*-DDD is not necessary for in vivo adrenocorticolytic action of the drug.

73-1144. Gellert, R. J.; Heinrichs, W. L.; Swerdloff, R. S. (Dept. of Obstet. Gynecol., Univ. Washington, Med. School, Seattle, WA 98195). **DDT homologues: estrogen-like effects on the vagina, uterus and pituitary of the rat.** *Endocrinology 91(4): 1095-1100; 1972.* (23 references)

The estrogenic activity of *o,p'*-DDT, *p,p'*-DDA, *p,p'*-DDD (TDE), and *p,p'*-DDE was investigated in female rats using three experimental models. In one model *o,p'*-DDT injected intraperitoneally once a day for 27 days significantly advanced the age of vaginal opening by four days and increased the weight of ovaries and uteri. Ten mg of *o,p'*-DDT or *p,p'*-DDA administered to mature ovariectomized rats for one week increased the uterine weight and caused a thickened, vacuolated uterine epithelium; *o,p'*-DDT also induced cornified vaginal smears and reduced serum LH concentrations, but not FSH titers. Neither *o,p'*-DDT nor *p,p'*-DDA at 0.1 or 10 mg reduced the hypertrophy of the remaining ovary in mature hemiovariectomized rats. Estrogenic activity was not observed with *p,p'*-DDE or *p,p'*-DDD. The results indicate that *o,p'*-DDT and a major metabolite, DDA, at pharmacologic doses, exert estrogenic activity by stimulating uterine and vaginal tissue and lower serum LH, probably by an inhibitory feedback effect at the pituitary gland or hypothalamus.

73-1145. Haegele, M. A.; Hudson, R. H. (U.S. Dept. Interior, Fish Wildlife Service, Bureau Sport Fish. and Wildlife, Bldg. 16, Denver Fed. Cent., Denver, CO). **DDE effects on reproduction of ring doves.** *Environ. Pollut. 4(1): 53-57; 1973.*

Ring doves fed a diet containing 40 ppm of *p,p'*-DDE for 126 days showed poorer reproductive performance than controls in all parameters measured. The interval between nestings was 2.5 times longer, 13.5% fewer eggs were produced per clutch, shell thickness was reduced 10%, and twice as many young died. Hatchability was also reduced, but not significantly, and no differences were observed in the length of time until birds removed from the nest returned. Only 10 young were successfully raised by DDE-treated pairs while 35 were raised by controls.

73-1146. Vojvodic, V. B.; Maksimovic, M. (Dept. Pharmacol. Toxicol., Inst. Tech. Med. Protection, Vojvode Stepe 455, Belgrade, Yugoslavia). **Absorption and excretion of pralidoxime in man after intramuscular injection of PAM-2Cl and various cholinolytics.** *Eur. J. Clin. Pharmacol. 5(1): 58-61; 1972.* (24 references)

The administration of 1.0 g of pralidoxime alone or in combination with cholinolytics to healthy male volunteers resulted in identical patterns of absorption and elimination. The peak blood levels, reached at 30 min, were 8.6 μg/ml in the group (1) given pralidoxome with atropine sulfate and benzactine hydrochloride, 6.3 μg/ml in the group (2) given pralidoxime chloride and benzactine hydrochloride, and 8.0 μg/ml in the subjects (3) given pralidoxime chloride alone. The half-lives were 62.2, 60.0, and 61.8 min, respectively, for groups 1,2,

and 3. The peak urine level of oxime was reached 45 min after injection. The level remained stable for 2 hr, then fell slowly. After 4 hr, 75.0, 79.6, and 69.5% of the doses administered had been excreted in the urine of the respective groups.

73-1147. Barnes, G. E.; Bishop, V. S.; Kardon, M. B. (Dept. Pharmacol., Univ. Texas Med. School, San Antonio, TX 78229). **Cardiac and peripheral vascular effects of pralidoxime chloride.** *Eur. J. Pharmacol. 20(2): 188-194; 1972.* (6 references)

Pralidoxime (2-PAM), used in the treatment of organophosphate poisoning, significantly increased cardiac output at all doses in open chest anesthetized dogs. A similar response was obtained in α-adrenergic blocked animals, but not with β-adrenergic blocked or reserpine treated animals. All doses of 2-PAM significantly increased mean arterial pressure in control, β-adrenergic blocked, and α-adrenergic blocked animals. 2-PAM at 20 and 40 mg/kg also increased arterial pressure in reserpine treated animals. Heart rate was decreased in all but the α-adrenergic blocked animals with 2-PAM. The total peripheral resistance of the β-blocked animals increased with every subsequent dose of 2-PAM although no significant increase was observed in controls. A smaller increase in total peripheral resistance was observed in reserpine-treated and α-adrenergic blocked animals. Significant increases in stroke volume and changes in stroke work were noted with all animals, each occurring at different atrial pressures depending on the treatment. The results suggest that 2-PAM directly stimulates the heart and vascular smooth muscle.

73-1148. Fahrig, R. (Zentrallab . fuer Mutagenitaetstestung der Deutschen Forschungsgemeinschaft, Freiburg, Germany). **Nachweis einer genetischen Wirkung von Organophosphor-Insektiziden. [Detection of genetic effect of organophosphate insecticides.]** *Naturwissenschaften 60(1): 50-51; 1973.* (4 references) (German)

Organophosphate insecticides were tested for mutagenicity based on the induction of mitotic gene conversion in *Saccharomyces cerevisiae*. The order of mutagenicity found was methylmethane sulfonate (reference substance of known mutagenicity) > dichlorvos > dimethoate > bidrin > oxydemetonmethyl. The slopes of the log conversion rate vs. log concentration curves were nearly the same for all substances. A correlation appeared to exist between the inactivating and genetic effects of the substances: the genetically most active insecticides, dichlorvos and dimethoate, also had the greatest inactivating effect. The similarities between the dose-effect relationships of the insecticides and of the reference material, methylmethanesulfonate, suggest that the genetic effect is based on the same mechanism: alkylation of DNA.

73-1149. Chadwick, R. W.; Freal, J. J. (Environ. Protect. Agency, Perrine Primate Lab., Perrine, FL 33157). **Comparative acceleration of lindane metabolism to chlorophenols by pretreatment of rats with lindane or with DDT and lindane.** *Food Cosmet. Toxicol. 10(6): 789-795; 1972.* (10 references)

The stimulation of [^{14}C]lindane metabolism in rats by pretreatment with DDT or lindane has been previously demonstrated in this laboratory. However, it appeared that the mechanism by which lindane induced its own degradation differed from the mechanism by which DDT stimulated lindane metabolism. The present study attempted to clarify some of the differences in the metabolism of lindane resulting from pretreatment of rats with DDT and with lindane itself. Daily treatment of rats with either lindane alone or with DDT plus lindane permitted an evaluation of the comparative urinary excretion of the lindane-derived chlorophenols. Rats receiving DDT plus lindane excreted significantly more 2,4,5-trichlorophenol and 2,3,4,6- and 2,3,4,5-tetrachlorophenols by the second day of treatment than did rats receiving lindane alone. Results of the study suggest that DDT treatment stimulates the metabolism of lindane through a selective effect on certain metabolic pathways involved in the oxidative degradation of lindane. (Author abstract by permission)

73-1150. Thompson, D. J.; Emerson, J. L.; Strebing, R. J.; Gerbig, C. G.; Robinson, V. B. (Dept. of Pathol. and Toxicol., Human Health Res. and Dev. Lab., Dow Chemical Co., Zionsville, IN). **Teratology and postnatal studies on 4-amino-3-5-6-trichloropicolinic acid (picloram) in the rat.** *Food Cosmet. Toxicol. 10(6): 797-803; 1972.* (7 references)

Four groups of 35 Sprague-Dawley-derived rats were given daily oral doses of 0, 500, 750, or 1000 mg picloram/kg/day on days 6-15 of gestation. Twenty-five dams from each group were killed on day 20 and the fetuses were examined for untoward effects; the remaining ten dams in each group were used in a postnatal study and were allowed to deliver and wean their litters. Dosage at 500 mg/kg/day produced no overt signs of toxicity, while rats given 750 or 1000 mg/kg/day developed hyperesthesia and mild diarrhea after 1-4 days of treatment, and 14 maternal deaths occurred between days 8 and 17 of gestation in these dosage groups. In surviving dams, doses up to and including 1000 mg/kg/day affected neither maternal weight gains, litter size, and resorption rate nor other reproductive parameters examined. Evidence of retarded fetal growth, as reflected by an increase in unossified fifth sternebrae, was observed in the treated groups. In the postnatal study, survival and development of pups was unaffected by treatment of the dams with picloram. It was concluded that oral administration of subtoxic and even of maternally toxic doses of picloram during organogenesis produces neither teratogenesis nor adverse effects on neonatal development in the Sprague-Dawley rat. (Author abstract by permission)

73-1151. Gibson, J. E. (Dept. of Pharmacol., Michigan State Univ., East Lansing, MI 48823). **Teratology studies in mice with 2-*sec*-butyl-4,6-dinitrophenol (dinoseb).** *Food Cosmet. Toxicol. 11(1): 31-43; 1973.* (8 references)

2-*sec*-Butyl-4,6-dinitrophenol (dinoseb) was administered daily to groups of pregnant Swiss-Webster mice during organogenesis, on days 8-16, 10-12, or 14-16 of gestation, by ip or sc injection or by oral intubation. Caesarean-delivered fetuses were examined for gross, soft-tissue, and skeletal anomalies. Administration of dinoseb in daily doses of 5 mg/kg ip, 10 mg/kg sc, or 20 mg/kg orally on days 8-16 had no adverse effect on embryonic or fetal growth and development. Doses of 17.7 mg/kg/day given ip on days 10-12, or 14-16 were toxic to the dams (hyperthermia) and embryos (increased resorption, reduced fetal size), but teratogenic effects (e.g. imperforate anus, acaudia) resulted from treatment only on days 10-12. Dinoseb given in sc doses of 17.7 mg/kg/day on days 14-16 showed maternal toxicity and embryotoxicity but not teratogenicity, while oral doses of 20 or 32 mg/kg/day showed maternal toxicity but essentially no embryotoxicity or teratogenicity. Dinoseb was concluded to have a low potential for the induction of terata in mice. (Author abstract by permission)

73-1152. Gibson, J. E.; Rao, K. S. (Dept. of Pharmacol., Michigan State Univ., East Lansing, MI 48823). **Disposition of 2-*sec*-butyl-4,6-dinitrophenol (dinoseb) in pregnant mice.** *Food Cosmet. Toxicol. 11(1): 45-52; 1973.* (6 references)

The disposition of 2-*sec*-butyl-4,6-dinitrophenol (dinoseb) was determined in pregnant mice after ip or oral administration. Plasma levels of dinoseb were determined colorimetrically and isotopically, and dinoseb was separated from its metabolites in tissues by methyl ethyl ketone extraction. Dinoseb was found in all maternal tissues and was shown to cross the placenta, although a barrier was clearly present since embryo levels never exceeded 2.5% of maternal plasma levels. The rate of absorption of dinoseb was 40 times greater after ip than after oral administration. Elimination was first order, but the rate was dependent on the route, the *ke* being 0.02 and 0.09 hr^{-1} after oral and ip administration, respectively. Pregnant mice excreted dinoseb in urine and feces regardless of the route of administration, and metabolites, which were not identified, were found in maternal liver and kidney and in the embryo, but not in maternal blood. While embryonic levels of dinoseb were similar in both cases, peak levels were reached much earlier after ip than after oral administration (8 min and 12 hr respectively), and the initial levels of the herbicide and its metabolites in the embryos were higher after ip administration. These differences may be responsible for the observed teratogenicity and embryotoxicity of dinoseb following ip but not oral administration. (Author abstract by permission)

73-1153. Palmer, K. A.; Green, S.; Legator, M. S. (Div. of Toxicol., Food and Drug Admin., Dept. of Health, Education, and Welfare, Washington, DC 20204). **Dominant lethal study of *p,p'*-DDT in rats.** *Food Cosmet. Toxicol. 11(1): 53-62; 1973.* (9 references)

p,p'-DDT was tested by the dominant lethal system in rats. Male rats were given DDT either ip or orally and were mated with two untreated females in each of the following three weeks. The pregnant females were sacrificed at approximately mid-term and were scored for corpora lutea, total implants, dead implants, and pre-implantation losses. A statistically significant effect was found in the proportion of females having one or more dead implants after being mated during week three with males given DDT orally in a dose of 100 mg/kg. No significant effects were found in females mated with ip-treated males. It is concluded that DDT is only marginally positive with respect to the dominant lethal test. (Author abstract by permission)

73-1154. Webb, R. E.; Miranda, C. L. (Dept. of Biochem. and Nutrition, Virginia Polytechnic Inst. and State Univ., Blacksburg, VA). **Effect of the quality of dietary protein on heptachlor toxicity.** *Food Cosmet. Toxicol. 11(1): 63-67; 1973.* (5 references)

The toxicity of heptachlor was studied in male weanling rats which had been fed different types of dietary protein for 10 days at two levels of protein intake. With a dietary protein level of 10% heptachlor was less acutely toxic in rats fed an unsupplemented gluten diet than in animals pair-fed diets containing gluten plus amino acids or casein plus 0.2% DL-methionine. When the level of dietary protein was raised to 18%, heptachlor was twice as toxic to rats pair-fed casein diets as to rats fed unsupplemented gluten. The clinical syndrome of intoxication was not affected by the quality of dietary protein fed, but the acute toxicity of heptachlor varied according to the method of feeding used. Animals fed casein diets ad lib. were less susceptible to heptachlor intoxication than were rats fed the same diets at a restricted level of intake. (Author abstract by permission)

73-1155. Shcherban', E. P. (Inst. Hydrobiol., Kiev, USSR). **Vliyaniye malykh kontsentratsiy pestitsidov na razvitiye i chislennost' potomstva nekotorykh Cladocera. [Effect of small pesticide concentrations on the development and count of subsequent *Cladocera* generations.]** *Gidrobiol. Zh. (Kiev) 6(6): 101-105; 1972.* (13 references) (Russian)

The effect of 1 mg/l. concentration of atrazine and 0.05-0.25 mg/l. concentration of diuron on the development and reproduction of subsequent generations of *Daphnia magna* Straus, *Moina macrocopa* (Straus), *Ceriodaphnia quadrangula* (O.F. Mueller), and *Scapholeberis mucronata* (O.F Mueller) was studied in labora-

tory tests for 30-35 days. Atrazine and diuron inhibited the embryonal and postembryonal development of *S. mucronata*; diuron inhibited the development of *M. macrocopa* and the embryonal and postembryonal development of *D. magna*; and atrazine inhibited embryonal development of *C. quadrangula*. *M. macrocopa* adapted itself to atrazine in one month after which stimulation of the reproduction was determined; short-term stimulation of *C. quadrangula* was followed by decline in the reproduction. A diuron concentration of 0.05 mg/l. inhibited 65% of the reproduction of *S. mucronata*. The lethality rate for 0.05-0.25 mg/l. concentrations of diuron ranged from 31.6 to 73%. Both pesticides were highly toxic, and *S. mucronata* was most sensitive to the pesticides.

73-1156. Yoshioka, Y.; Hara, A.; Nawa, H.; Yoshioka, H.; Iwasaki, I. (Okayama Univ., Med. Sch., Japan). **[Degradation of DDT and dieldrin in the living body.]** *Igaku No Ayumi (Progr. Med.) 80(13): 811-812; 1972.* (8 references) (Japanese)

Five microcuries each of ^{14}C-DDT and ^{14}C-dieldrin were orally administered to mice and autoradiography was taken. The total autoradiography did not show striking differences between the intakes of DDT and dieldrin. Residues in liver, fat, and bone marrow were noted, especially in fat tissues and relatively small amounts remained in the brain. DPM/g in each organ reached the maximum level in about 48 hr. The 48 hr count was extremely high in the liver compared to other organs. The DPM/g transitions in the kidney and urine were approximately parallel, and about 90% of the total DPM was excreted in the urine. The ^{14}C count drastically decreased in brain in five days; fat showed a rather high count of radiation even five days after the administration. The body may degrade small amounts of chemicals such as DDT and dieldrin to prevent a concentration build-up above a specific level. Experimental dieldrin administration to humans reached similar conclusions. Complete excretion took more than one month, and DDT and dieldrin remained especially long in the fat.

73-1157. Arora, H. C.; Sharma, V. P.; Chattopadhaya, S. N.; Shinha, L. P. (CPHERI, Kanpur Zonal Lab., Kanpur-2, India). **Bioassay studies of some commercial organic insecticides–part III. Trials of *Cirrhina mrigala* (*Hamp.*) with six insecticides.** *Indian J. Environ. Health 14(4): 352-359; 1972.* (3 references)

Toxicity of six insecticides to fingerling of a carp, *Cirrhina mrigala*, was studied. Endosulfan at 0.0055 mg/l. caused death within 6 hr and there were no survivors at 24 hr. Almost 100% mortality was recorded within 12 hr with 0.20 mg/l. Morocide (binapacryl). Ekatin (thiometon) at 1.50 mg/l. produced 100% mortality within 24 hr as did Dimecron (phosphamidon) at 200 mg/l. Zero percent survival was observed with 10 mg/l. Nuvan (dichlorvos) at 24 hr. Methyl demeton produced 100% mortality within 24 hr at a concentration of 9.99 mg/l. Distress was only observed with endosulfan and Morocide. TLm values in mg/l. at 48 hr ranged from 0.0018 for endosulfan to 142.00 for dimecron. A synopsis of the characteristics of each insecticide is included.

73-1158. Al-Rubae, A. Y.; Knowles, C. O. (Dept. of Entomol., Univ. of Missouri, Columbia, MO 65201). **Metabolism of chloropropylate and bromopropylate acaricides by twospotted spider mites and house flies.** *J. Econ. Entomol. 65(6): 1600-1603; 1972.* (4 references)

Chloropropylate (isopropyl 4,4'-dichlorobenzilate) and Acarol (bromopropylate; isopropyl 4,4'-dibromobenzilate) are chemically related specific acaricides. Toxicity of chloropropylate and bromopropylate to the twospotted spider mite, *Tetranychus urticae* Koch, determined by the slide-dip technique was 3.3 and 2.9 ppm, respectively, whereas toxicity to the house fly, *Musca domestica* L., determined by topical application, was greater than 500 ppm. Spider mites and house flies absorbed and metabolized the ^{14}C-labeled benzilate acaricides; metabolites tentatively identified by cochromatography included the respective halogen-substituted benzilic acid, benzhydrol, benzophenone, and benzoic acid. Although differences in both penetration and metabolism of chloropropylate and bromopropylate were detected between spider mites and house flies, they were not substantial enough to account for the marked selective toxicity of the two acaricides.(Author abstract by permission)

73-1159. Galdney, W. J.; Ernst, S. E.; Dawkins, C. C.; Drummond, R. O.; Graham, O. H. (Entomol. Res. Div., Agr. Res. Serv., U.S. Dept. of Agr., Kerrville, TX 78028). **Feeding systemic insecticides to cattle for control of the tropical horse tick.** *J. Med. Entomol. 9(5): 439-442; 1972.* (9 references)

Six systemic insecticides, coumaphos, crufomate, famphur, fenthion, ronnel, and Imidan (phosmet), were added to the feed of cattle artificially infested with *Anocentor nitens*. One animal given fenthion at 2.5 mg/kg/day for 12 days died of insecticide poisoning. Death was induced by Imidan at 1.5 mg/kg/day in one animal 24 days post infestation. Famphur (33.3% commercial feed premix) administered at 5 mg/kg/day for as little as 7 days appeared to be the most useful in the control of multiple infestations of the tick, *A. nitens*.

73-1160. Lancaster, R. (The Middlesex Hosp. Med. School, London W1P 5FE, England). **Inhibition of acetylcholinesterase in the brain and diaphragm of rats by a tertiary organophosphorous anticholinesterase and its quaternary analogue; in vivo and in vitro studies.** *J. Neurochem. 19(11): 2587-2597; 1972.* (20 references)

Results of an investigation of the inhibition of AChE by pinacolyl *S*-(2-dimethylaminoethyl)methylphosphonothioate (I) and pinacolyl *S*-(2-trimethylaminoethyl)methylphosphonothioate (II) indicate that testing these compounds with rat cerebral cortex or diaphragm in vitro does not measure effect on "functional" AChE. Compound I was 34,800 times more lipid soluble than compound II from chloroform/water partition coefficients. Compound I diffused through a cerebral cortex slice when applied at the intact surface in vitro at a rate 12 times that of compound II. With diaphragm slices, a 4-fold difference in diffusion rates was obtained. When applied to the intact surface of the cerebral cortex slice or a diaphragm segment for 10 min, compound I reached AChE sites more rapidly than compound II as determined by percentage of inhibition of AChE. There was no evidence of two fractions of AChE which differed greatly in accessibility to the quaternary compounds. Inhibition was higher after 10 min in cortex slices than in diaphragm segments. Subcutaneous administration of both compounds in equimolar amounts resulted in similar peak plasma levels and rates of removal for each compound, and over 90% inhibition was observed in each tissue with about 5 μmol/kg of compound I. Even in lethal doses, compound II produced only marginal inhibition in cortex and 50 to 60% inhibition in diaphragm.

73-1161. Cox, B.; Stobart, G. (Pharmacol. Dept., Manchester Univ., Manchester, M13 9PT, England). **Effects of four cholinesterase inhibitors on the response of the guinea-pig isolated ileum to transmural electrical stimulation.** *J. Pharm. Pharmacol. 24(10): 828-829; 1972.* (6 references)

Two organophosphates (eserine and neostigmine) which may release ACh and two others (dyflos and mipafox) which may not adequately protect it, were tested for potentiation of ACh on isolated guinea pig ileum, stimulated electrically or by the addition of ACh to the tissue bath. The results are described in a Letter-to-the-Editor. All four compounds produced similar leftward shifts in the ACh log concentration effect lines. Shifts in the frequency effect lines were significantly less than shifts in the concentration effect lines with dyflos and mipafox; there were no significant differences between shifts when eserine or neostigmine were used. Endogenous ACh released by transmural stimulation was poorly potentiated by the organophosphorus inhibitors, probably because the ACh comes predominantly from the myenteric plexus, rich in AChE. The organophosphorus inhibitors are less active AChE inhibitors than the reversible inhibitors.

73-1162. Nunotani, H. (Kurume Med. Coll. Sch. of Pub. Health, Japan). **[Effects of organomercury compounds on mother and fetus.]** *Kurume Igakkai Zasshi (Kurume Med. J.) 35(2): 1862; 1972.* (Japanese)

Methylmercuric chloride (MMC) and phenylmercuric acetate (PMA) were respectively administered to non-pregnant female rats at a total mercury level of 60 mg/kg to study effects on conception and the fetus. The weight of the test animal and the rate of conception significantly decreased compared to controls. The weight of the pups of the test animals was also lower than that of controls. Growth rate of the pups in the MMC group began to decrease immediately after delivery while that of PMA groups decreased after six weeks. The mercury content of organs in the dams and pups was greater in MMC groups than in PMA groups, except in the kidney. The permeability of MMC through the placenta was demonstrated by determining total mercury and MMC levels; however, no uptake of PMA by the fetus has been recognized. No pathological finding specifically due to organomercury intoxication was found in any group; however, a slight pathological change was seen in the liver and kidney of dams and pups of MMC groups.

73-1163. Maebashi, H. (Kurume Med. Coll., Sch. of Environ. Health, Japan). **[On the pathogenicity to mammals of the new bacterial insecticide, *Bacillus* moritai.]** *Kurume Igakkai Zasshi (Kurume Med. J.) 35(12): 1863; 1972.* (Japanese)

Bacillus moritai, isolated from soil, effectively invade larvae of house fly, proliferate, and destroy them. Its safety as a bacterial insecticide was studied using mice and rabbits. No anomaly was found after orally administering 12.5 g of powdered spores/kg and the bacteria were not detected in the mouse blood. The LD50 i.p. for mouse was 350 mg/kg body weight and bacteria were detected in the blood. However, the bacteria did not seem to be pathogenic and quickly disappeared. Subsequent intravenous injection of the bacteria into previously injected animals did not increase the infectious potency of the bacteria. After administering *B. moritai* orally to rabbits for 100 days, another bacterium was detected in the blood, suggesting the necessity of rigorous examination of the products before marketing. In another experiment the bacteria were administered daily for 70 days. The number of the bacteria in the blood was small and inconsistent and the number in major organs highest after three months, decreased after seven months, and disappeared rapidly after administration.

73-1164. Constantin, M. L. (Orvos-Radiologiai Akademiai Tanszeki Kutatocsoport, Semmelweis Orvostudomanyi Egyetem, Budapest 8, Ulloi ut 78, Hungary). **Effects of insecticides on acariasis in mice.** *Lab. Anim. 6(3): 279-286; 1972.* (7 references)

In conjunction with tests of efficacy in controlling two species of mites in the mouse, the toxicity of four insecticidal preparations was investigated. Mice were dipped into the acaricidal solution five times in three days and losses were recorded for 30 days. No mortality was observed with "Bayer 9010" liquid at 1% or mala-

thion at 4%, but 2 of 20 animals died after treatment with Tetocid (BHC) at 2% and with Pyractone (pyrethrins plus bucarpolate) at 3%. Since Pyractone was the most effective mite control agent, it was tested for effects on reproduction. At 1%, the concentration to be used routinely, it did not alter mean reproduction rate or reduce fertility, and at 0.5% newborn mice could be treated without losses.

73-1165. Roberts, D. (Mar. Biol. Sta., Univ. Liverpool, Port Erin, Isle of Man, U.K.). **The assimilation and chronic effects of sub-lethal concentrations of endosulfan on conditions and spawning in the common mussel *Mytilus edulis*.** *Mar. Biol. 16(2): 119-125; 1972.* (24 references)

The rate of uptake and elimination of endosulfan at sub-lethal concentrations and its effects on general conditions and reproduction were studied in a marine bivalve, *Mytilus edulis*. Tissue residue levels increased rapidly during the first month at each exposure level. At 0.5 and 1.0 mg/l. levels continuously increased throughout the 112 day exposure period. Endosulfan was concentrated to a higher degree at low exposure levels (22.5 times at 0.1 mg/l.). After exposure was terminated, residues dropped markedly. The higher concentrations of the insecticide protracted the spawning period, and the condition of the mussels declined steadily during exposure to 1.0 mg/l. endosulfan.

73-1166. Vogel, E. (Zentrallaboratorium fuer Mutagenitaetsprueftung der Deutschen Forschungsgemeinschaft, Freiburg i. Br., Germany). **Mutagenitaetsuntersuchungen mit DDT und den DDT-metaboliten DDE, DDD, DDOM und DDA in *Drosophila melanogaster*. [Mutagenicity studies with DDT and its metabolites DDE, DDD, DDOM, and DDA in *Drosophila melanogaster*.]** *Mutat. Res. 16(2): 157-164; 1972.* (30 references) (German)

DDT and its metabolites were tested for mutagenic activity using male germ cells of *Drosophila melanogaster*. Only DDA, the primary urinary metabolite of DDT in mammals, induced recessive lethals according to the Basc-technique. Mature sperm were most sensitive while spermatids and spermatocytes were more resistant. Some results indicated that DDT could be a very weak mutagen in *Drosophila;* doses above 0.14 m mol/l. could not be tested because of toxicity. DDE, TDE, and DDOM were not active. Conversion of DDT to DDE or DDA, characteristic of mammalian systems, does not occur in *Drosophila*, since hydroxylated products predominated.

73-1167. Voogd, C. E.; Jacobs, J. J. J. A. A.; Van Der Stel, J. J. (Nat. Inst. of Pub. Health, Bilthoven, The Netherlands). **On the mutagenic action of dichlorvos.** *Mutat. Res. 16(4): 413-416; 1972.* (8 references)

Solutions of dichlorvos at the limit of solubility (0.0065 mole/l.) were weakly mutagenic to most of the bacterial species tested. Solutions of 0.0032 and 0.0065 mole/l. dichlorvos increased mutation rates 3.4 and 7.6 times in *Salmonella typhimurium*. Results of the host-mediated assay were inconclusive because of the low dose (0.2 mg) administered, but high toxicity prevented testing of larger doses. Comparative studies indicated that dichlorvos was about twice as mutagenic as caffein. The increases of mutation frequency observed in this experiment with dichlorvos are considered insufficient to classify it as dangerously mutagenic to man.

73-1168. Schulte-Hermann, R.; Schlicht, I.; Koransky, W.; Leberl, C.; Eulenstedt, C.; Zimek, M. (Inst. fuer Toxikol. und Pharmakol. der Philipps-Univ. Marburg, D-3550 Marburg a.d. Lahn, Pilgrimstein 2, Germany). **Selective inhibition of liver-cell proliferation by CFT 1201 and SKF 525 A. Studies on growth processes induced by drugs and by partial hepatectomy.** *Naunyn-Schmiedebergs Arch. Pharmacol. Exp. Pathol. 273: 109-122; 1972.* (49 references)

Adminstration of α-BHC at 200 mg/kg increased liver weight and DNA about 30%. CFT 1201, an inhibitor of microsomal mixed function oxidase, enlarged liver and increased DNA. When the two substances were administered concomitantly, there was no additive effect. α-BHC increased incorporation of ^{3}H-thymidine into DNA, the number of DNA-replicating cells, and the frequency of mitosis. CFT 1201 completely suppressed the rate of cell proliferation induced by α-BHC. SKF 525 A, related to CFT 1201, also inhibited the effects of α-BHC. These inhibitors also blocked the effects of BHT and phenobarbital. Inhibition by CFT 1201 apparently takes place before the beginning of DNA synthesis since regenerative response was not blocked by this compound. CFT 1201 and SKF 525 A both effectively inhibited reactions catalyzed by cytochrome P 450, indicating that normal function of this enzyme system may be required for growth induction by α-BHC.

73-1169. Fenichel, G. M.; Kibler, W. B.; Olson, W. H.; Dettbarn, W. D. (Dept. Neurol., Vanderbilt Univ. School Med., Nashville, TN 37203). **Chronic inhibition of cholinesterase as a cause of myopathy.** *Neurology 22(10): 1026-1033; 1972.* (33 references)

Paraoxon, administered daily to rats, produced a histological picture of myopathy in each skeletal muscle studied. Focal necrosis appeared first and was followed by complete fiber necrosis and phagocytosis. At 0.75 mg/kg, the number of new lesions increased up to the ninth day and then decreased. At a dose of 0.25 mg/kg more time was required to produce the same number of lesions and myopathy never ceased to progress during the 18 day experiment. Denervation of the muscle prior to paraoxon treatment virtually abolished the production of myopathy, and simultaneous injection of hemicholinium, which blocks the uptake of choline,

markedly inhibited it, supporting the concept of an abnormal neurotrophism as a mechanism of myopathy. The primary defect may be in the cholinergic system of either the nerve or the muscle.

73-1170. Ueda, K. (Tokyo Dental College, Sch. of Hyg., Japan). **[Disturbance of human health by chemical substances—toxicity of organochlorine compounds.]** *Nippon Ishikai Zasshi (J. Jap. Med. Ass.) 69(2): 207-216; 1973.* (Japanese)

General physiological properties of organochlorine (organohalogen) compounds are reviewed. Organochlorines are very soluble in fats, accumulating in fat tissues and in the liver, are narcotic, produce acne, and damage the liver. Metabolic and detoxicating mechanisms such as glutathione-*S*-alkyltransferase on alkylhalogen compounds, glucuronate-conjugation and excretion on chlorophenolic compounds, and mercapturic acid formation and excretion on partially dechlorinated and bonded to glutathione compounds are reviewed in terms of applicability to new chemicals and typical organochlorine chemicals. Among the compounds are tri- and tetrachloroethylene, monomeric vinyl chloride, and polychlorobiphenyls. The actions of the following are described: methyl bromide which causes pulmonary edema; chloronitro and chloroamino compounds which cause cyanosis and anemia by producing methemoglobin; chloropicrin which causes pulmonary edema and serious congestion; pentachlorophenol which inhibits oxidative phosphorylation; derivatives of dinitrochlorophenol such as DNBP which also inhibit oxidative phosphorylation. Knowledge of the physiological properties common to polychloro compounds due to their chemical structure is important for preventing and diagnosing injuries.

73-1171. Takabe, A.; Hiramatsu, K.; Toriumi,T. (Okayama University, Japan). **[A study on the translocation of phenyl mercuric acetate to hen's egg.]** *Nippon Juigaku Zasshi (Jap. J. Vet. Sci.) 34: 264-265; 1972.* (Japanese)

A white Leghorn pullet orally administered a single dose of 32 mg/kg of phenyl mercuric acetate (PMA) laid eggs containing mercury four days after administration; mercury mainly concentrated in the yolk at 0.27% of the amount administered. The mercury in the yolk increased to 0.73% of the amount administered after seven days, decreased to 0.036% after 20 days, and disappeared after about 40 days. A very small amount of mercury was detected, 0.048% (max.), in the albumen after 4 days and decreased to almost zero after 12 days. In another experiment, two groups of pullets were fed a feed containing 20 ppm and one ppm of PMA, respectively, for seven weeks. The concentration of mercury in the yolk of the eggs of the 20 ppm group reached 3.6 ppm at the beginning of mercury feeding, then leveled to 3.5-4.0 ppm (5% of the estimated daily intake of mercury) during the study. The mercury level in whole blood stabilized at 1 ppm after two weeks. Values for the 1 ppm group were 0.22 ppm in the yolk and 0.1 ppm in whole blood. The egg-laying rate did not differ from controls.

73-1172. Akabori, F.; Masaoka, K.; Suzuki, M. (Azabu Vet. Med. Coll., Japan). **[Fundamental studies on examination of pesticide toxicities. Part 7. The acute toxicity of 2-*sec*-butylphenyl *N*-methylcarbamate to cocks and quails.]** *Nippon Juigaku Zasshi (Jap. J. Vet. Sci.) 34: 265-266; 1972.* (Japanese)

The oral LD50 and acute toxicity were determined for 2-*sec*-butylphenyl *N*-methylcarbamate (Osbac) in cocks (9 weeks old) and Japanese quails (9 weeks) at 1400 and 240 mg/kg, respectively. The major symptoms were common to both birds and included depression, inactivity, restlessness, and tonic spasm just before death. Cocks died within 24 hr and quails died within one hr. Body weight of the surviving birds decreased one to six days after administration, and then increased with the level of administration. Heart rate decreased after 20 min in cocks and after 5-10 min in quails; the rate of decrease was larger in the moribund birds, and arrhythmia occurred just before death. Respiration increased after 20 min in both species. The gizzard action potentials were clearly inhibited after 1-2 min. The body temperature change decreased slightly in cocks and more in quails. Desquamation of mucosa of the crop, spotlike hemorrhage on the transitional zone of glandular stomach and gizzard, expansion of vessels in intestinal wall and of vessels in brain, and congestion of the pancreas were noticed in both species. Tonic spasms were not recorded by EMG. Miosis was not examined.

73-1173. Kobayashi, H.; Yuyama, A.; Matsuzaka, N. (Iwate University, Japan). **[On the effects of administration of dichlorvos on the content of acetylcholine in the brain of rats and on the ability of synthetizing acetylcholine.]** *Nippon Juigaku Zasshi (Jap. J. Vet. Sci.) 34: 270; 1972.* (Japanese)

One milligram per kilogram of dichlorvos was daily administered subcutaneously to female Wistar rats for 40-50 days. The day after the last administration, ChE activities in the brain and in the blood decreased 60 and 40%, compared to those of controls to which the solvent only was administered. ACh in the brain of test animals, even divided into free-ACh and bound-ACh, was insignificantly greater than that of controls. ACh synthesis was insignificantly lower than controls. After administering dichlorvos at 0.2 mg/kg/day for 65-75 days, ChE activities in the brain and in the blood decreased 40 and 15% as compared to those of controls. The amount of bound ACh in the brain was somewhat higher than that of controls. ACh-synthesizing activity was a little less than that of controls, but not significantly. No external anomaly was observed in the two groups of rats administered dichlorvos daily at levels of 1 mg/kg and 0.2 mg/kg.

73-1174. Toyama, T.; Takasawa Y. (Mitsui Toatsu Co., Ltd., Japan). **[CNP (MO).]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 23: 1-14; 1971.* (49 references) (Japanese)

MO 338 (CNP) (2,4,6-trichlorophenyl 4-nitrophenyl ether) is a low-toxicity herbicide used in place of PCP. It is a yellow crystal powder soluble in benzene, slightly soluble in alcohol, and insoluble in water. MO pellets and particles are effective herbicides in rice paddies, and the emulsion is effective for carrots, cabbages, turnips, and other types of vegetables. Its physiochemical properties, toxicity, selective herbicide capacity, degradation in the soil, efficiency measurements, patents, and other aspects are discussed. The LD50 for mice by epidermal administration is 11,800 mg/kg. Oral administration of MO to rats for three months at 10 mg/day produced no recognizable symptoms. Eleven g/kg of MO mixed in rat food for one year produced no damage in organs or blood cells. The TLm for fish is 40 ppm in 48 hours for larger fish and 40 ppm in three hours for rough fish.

73-1175. Asakawa, M. (Min. of Agr., Agr. Tech. Res. Inst., Japan). **[Carbamate pesticides.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 24: 1-15; 1971.* (Japanese)

The carbamate pesticides utilize carbamic acid ($HOOCNH_2$) as the effective toxic element; those developed in Japan are all substituted phenyl *N*-methylcarbamates and used against rice insects. All are highly hazardous, but some powder form carbamates are not designated toxic. Direct contact should be strictly avoided, masks and gloves used; and all skin covered. Extended spraying or work when fatigued should be avoided; after spraying, the face, hands, and feet should be washed thoroughly. If poisoning symptoms develop, atropine sulfate can be used for treatment. PAM is not effective. A three-month administration of 900 ppm MPMC to male rats and 2700 ppm to female rats produced no mortalities; no abnormal signs such as increased weight or swollen organs were noted. For MIPC the effective level is more than 25 mg/kg/day for rats and 100 mg/kg/day for mice; the no effect level is less than 2 mg/kg/day for rats and less than 12 mg/kg/day for mice. The oral LD50 of MPMC for rats (mg/kg) is 380 for males and 290 for females; the oral LD50 for BPMC is 340. The acute dermal LD50 for MTMC is >6, MPMC >1.5, MIPC >7.6, and EMPC 2.6.

73-1176. Shishido, T. (Section of Plant Pathol. and Entomol., Inst. for Agr. Sci., Kita, Tokyo, Japan). **[Metabolism of organophosphorus insecticides: general remarks.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 29: 1-14; 1972.* (78 references) (Japanese)

Organophosphate metabolism is reviewed taking dialkyl arylphosphorothionates $(RO)_2P(S)OX$, as examples where R denotes a lower alkyl radical and X denotes substituted phenyl or a hetero ring. The three major metabolic pathways known to date are oxonization (I) yielding $(RO)_2P(O)$-OX, cleavage of P-O-X (II and III) yielding $(RO)_2P(S)$-OH and $(RO)_2P(O)$-OX, respectively, and the cleavage of P-O-R (IV and V) yielding (RO) (HO)P(S)-OX and (RO) (HO)P(O)-OX, respectively. The products obtained by routes II-V do not show insecticidal activity and the reactions represent detoxication; route I forms strong ChE inhibitors, phosphate triesters, and represents an activation reaction. Various chemical changes in the leaving group X do not destroy the insecticidal activity of the molecule unless the lipophilic property of the molecule is eliminated. Reactions II-IV have been considered to be hydrolytic, mediated by esterase or phosphatase; recently, oxidative cleavage by microsomal mixed-function oxidase and conjugative cleavage by glutathione transferase have been demonstrated in higher animals and insects. Oxidative removal of sulfur mediated by cytochrome P-450 and microsomal electron transfer systems, oxidative dealkylation mediated by hepatic mixed function oxidase, and oxidative dearylation mediated by microsomes in the presence of NADPH and O_2 have recently been demonstrated in various organisms. The P-O-aryl bond cleavage by microsomal mixed function oxidase includes two reactions, oxidation and hydrolysis (in the case of dyfonate). Degradation studies of individual compounds and metabolites must be continued until sufficient information is available to permit generalizations.

73-1177. Takita, K.; Kanazawa, T. (Kumiai Chem. Ind. Co. Ltd., Chiyoda, Tokyo, Japan). **[Benthiocarb (Saturn), a new domestically produced herbicide.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 29: 15-22; 1972.* (19 references) (Japanese)

Benthiocarb is a herbicide registered for use in paddy fields in Japan. Toxicological data are as follows: acute oral LD50 560 mg/kg in rat, 1300 mg/kg in mouse; acute dermal LD50 2900 mg/kg in rat; toxicity (TLm) to young carp 3.6 ppm (48 hr). In subacute toxicity tests (fed for 90 days in diet at 600 ppm) the maximum no-effect level was 75 ppm (7 mg/kg/day) in rats. Taking a safety factor of 2000, the safety limit for a man weighing 50 kg is calculated as 0.35 ppm in the diet. Although Saturn is a carbamate, it does not inhibit ChE and does not irritate the eyes and skin of rabbits. No abnormalities were found in the serum lactate dehydrogenese isozyme pattern after s.c. injection of 2,000 mg/kg in the rat. Residue levels in unpolished rice 95-118 days after two applications in paddy field were less than 0.005 ppm. The range of persistency in soil was broad: half-life of less than a week to more than two months, depending on soil properties and weather conditions. No metabolites other than Saturn itself were found in the soil.

73-1178. Nishiuchi, Y.; Yoshida, K. (Agr. Chem. Inspection Sta., Min. of Agr. and Forestry, Japan). **[Toxicity**

of agricultural chemicals to tadpoles (Part 2).] *Noyaku Seisan Gijutsu (Pestic. Tech.) 29: 23-28; 1972.* (3 references) (Japanese)

Toxicities of 95 agricultural chemicals (technical and formulations) including 23 insecticides, 36 fungides or agricultural antibacterials, and 36 herbicides were tested on tadpoles of two species of amphibia, *Bufo bufo japonicus* Schlegel and *Rana (Rana) catesbeiana* Shaw. The technical materials were first dissolved in acetone, then diluted with tap water. Formulations were diluted directly with tap water dechlorinated by passing over activated charcoal. Although no insecticide showed high toxicity, tricyclohexyltin hydroxide, benzomate, and APC (4-diallylamino-3,5-dimethylphenyl *N*-methylcarbamate) showed relatively high toxicity with TLm (48 hours) values of 0.73, 2.0, and 1.3 ppm in toad tadpoles. The tadpoles' skin peeled off in aqueous solutions containing more than 1.0 ppm of tricyclohexyltin hydroxide. Of the tested fungicides or bactericides, triasyn (dyrene), difolatan, copper 8-oxyquinoline, fentin hydroxide, and phenylmercury fluoride showed fairly high toxicities, with TLm (48 hours) of 0.26, 0.28, 0.28, 0.18, and 0.12 ppm, respectively. Except for sodium phenate, no herbicide showed high toxicity to the tadpoles; TLm (48 hours) values were less than 1 ppm only in ioxynyl (0.67) and 2-amino-1,3-dichloro-1,4-naphthoquinone (0.85). The susceptibility of the tadpole of *Bufo bufo japonicus* to 10 pesticides tested, was highest seven days after hatching. Tadpoles of *Rana catesbeiana* were more susceptible to the pesticides tested than those of *Bufo bufo japonicus.*

73-1179. Arscott, G. H.; Robson, W. A.; Tinsley, I. J. (Dept. Poultry Sci., Oregon State Univ., Corvallis, OR 97331). **Effect of DDE and DDT on reproductive performance of adult white Leghorn male chickens.** *Nutr. Rep. Int. 6(6): 307-311; 1972.* (8 references)

A 32 week exposure to DDE or DDT markedly affected reproductive performance in adult white Leghorn males. Although semen volume was lower with the addition of 100 to 200 ppm DDE or 100 ppm DDT to the diet, the differences were not significant. Fertility and hatchability of fertile eggs were not significantly affected. Birds fed DDT did not gradually increase in body weight as did controls. In one case testes weight was greatly reduced. Tremors characteristic of DDT intoxication appeared at 15 wk in one bird fed DDT and at 31 wk in one receiving 200 ppm DDE.

73-1180. Javid, M. Y.; Hassan, F. (Dept. of Zool., Univ. of the Punjab, Lahore, Pakistan). **Effect of temperature and sublethal DDT treatment on the brain tissue oxygen consumption of *Channa punctatus*.** *Pak. J. Sci. Ind. 23(1-2): 81-88; 1971.* (26 references)

Oxygen consumption of brain tissue from fish (*Channa punctatus*) after 24 hr exposure to DDT was greater than control level at 5 ppb, fell slightly lower than control level at 10 ppb, and equaled that of controls at 20 ppb. Oxygen consumption increased with 50 and 100 ppb DDT. Males had a higher rate of oxygen consumption then females, as was the case in untreated fish. Since the acclimatory mechanism may be affected by DDT, more work in this area is needed.

73-1181. Smart, N. A.; Hill, A. R. C.; Roughan, P. A. (Plant Pathol. Lab., MAFF, Harpenden, England). **Residues of some chlorinated hydrocarbon pesticides in milk and milk products after their addition to the feed of cows.** *Pestic. Sci. 3(4): 415-419; 1972.*(8 references)

Lactating cows fed 0.05 part/million aldrin, 0.2 part/million γ-BHC, and 2.0 parts/million *p,p'*-DDT in their concentrate ration gave detectable residues of dieldrin, γ-BHC, *p,p'*-DDE, *p,p'*-TDE and *p,p'*-DDT in the milk and also aldrin in the butter and cheese. The levels found after 28 days of feeding were not significantly greater than those after 14 days. Subsequent increase of the pesticide content of the feed increased the residue content of the milk, butter, and cheese. Only a small percentage of pesticide residue was found in the buttermilk, separated milk, and the whey. (Author abstract by permission)

73-1182. Garraway, J. L. (Dept. of Phys. Sci., Wye Coll., Ashford, Kent, England). **Non-biological and fungal transformations of fungicides.** *Pestic. Sci. 3(4): 449-455; 1972.* (76 references)

Metabolism of pesticides can modify selective toxicity by activation or detoxication, as well as altering persistence, uptake, or mobility. Recent literature on fungicide metabolism is reviewed. Chemical decomposition of fungicides in soil or on leaf surfaces may lead to enhanced toxicity as in the case of compounds which release free phenol or yield products whose effects have not yet been determined. Recent studies on fungitoxic action have revealed five principal types of interactions with fungal cell components; it is often difficult to distinguish these from metabolic conversions. Enzyme-mediated transformations of fungicides by fungi include oxidation, reduction, alkylation, dealkylation, hydrolysis, and hydroxylation. Enzymes responsible for these transformations have been isolated from many soil fungi.

73-1183. Dedek, W.; Schmidt, R. (Deutsche Akad. der Wissenschaften zu Berlin, Forschungsstelle fuer Chem. Technol., Leipzig, DDR). **Untersuchungen zum transplazentaren Transport und Metabolismus von ^{3}H-und ^{14}C-markiertem DDT in graviden Maeusen unter Hungerbelastung. [Studies on the transplacental transport and metabolism of ^{3}H- and ^{14}C-labeled DDT in pregnant mice under hunger stress.]** *Pharmazie 27(5): 294-297; 1972.* (18 references) (German)

After intraperitoneal injection of radiolabeled DDT in olive oil to pregnant mice at various stages of

gestation, the levels of DDT and its metabolites in fetal blood were approximately 50% of those in maternal blood. The proportion of DDT and metabolites in the fetal liver and brain in relation to the maternal organs was somewhat lower. The DDT contents in organs of mothers and offspring decreased fairly rapidly after birth of the young. The DDT contents in maternal and fetal organs increased during starvation. The starvation stress was produced by withholding feed for 48 hr after the last injection in mice given 0.5 mg DDT/day on days 10-16 of gestation. During the three day experimental period, the principal metabolites found were DDD (TDE), DDA, and DDOH; smaller quantities of DDE and DCB were found, especially in the liver. The ratios of the metabolites remained unchanged during hunger stress, except that the fraction of DDE increased slightly.

73-1184. Demozay, D. (Author address not given). **Un symposium international sur le lindane. [International Symposium on Lindane.]** *Phytoma 25(244): 36-37; 1973.* (French)

Proceedings of the International Symposium on Lindane, held in Vienna, Austria, June 9, 1972, are summarized. The maximum allowable daily intake for man is determined at 0.0125 mg/kg, a level about 100 times lower than the residue concentrations actually found, and 10,000 times less than the minimum effective dose. Poisoning tests carried out on rats and dogs showed elimination of lindane within a few days following accumulation of high amounts in the organism; prolonged administration led quickly to an equilibrium between accumulation and elimination, and to rapid elimination after the treatment was stopped. Although lindane activates hepatic enzymes, it is not teratogenic or embryotoxic.

73-1185. Lin, S. C.; Funke, B. R.; Schultz, J. T. (Dept. Bacteriol. N. Dakota State Univ., Fargo, ND 58102). **Effects of some organophosphate and carbamate insecticides on nitrification and legume growth.** *Plant Soil 37(3): 489-496; 1972.* (9 references)

The effects of six organophosphate and three carbamate insecticides were investigated on soil nitrification, growth of legume seedlings, and rhizobia growth. At normal field application rates (5 ppm) nitrification in samples of Bearden loam soil was not affected by any of the insecticides. A persistent inhibition at 500 ppm was observed with Dyfonate, trichloronate, Dursban (chlorpyrifos), and Nemacur-P. Dyfonate and Dursban did not affect growth of *Rhizobium trifolii, Rh. leguminosarium, Rh. meliloti,* or *Rh. japonicum.* The most toxic materials tested were trichlorfon and trichloronate, and *Rh. leguminosarium* and *Rh. trifolii* were the most sensitive to inhibition. Dursban, aprocarb (propoxur), carbofuran, and aldicarb were most toxic to legume seedlings. However, applications of 50 ppm of these compounds did not affect appreciably the growth of legume seedlings. There was no consistent correlation between inhibition of growth of nodulating bacteria and inhibition of legume growth.

73-1186. Gupta, P. K.; Paul, B. S. (Dept. of Pharmacol., Coll. of Vet. Med., Punjab Agr. Univ., Ludhiana, India). **Influence of dietary intake of malathion on the haematology and plasma electrolytes in chickens.** *Poultry Sci. 51(5): 1574-1577; 1972.* (12 references)

Malathion is routinely employed for protecting grains from insects. In this communication, the feeding of 0.08 (800 ppm) and 0.16 (1600 ppm) percent malathion sprayed feed to chickens for one month on various hematological parameters and plasma electrolytes has been reported. A total of 90 chickens of both sexes (2-3 months old) were used. The WBC count was slightly increased with both the treatments and the maximal rise of the order of 5.26 thousand per cubic milliliter was seen with 1600 ppm treatment on 20th day. The exact mechanism for the increase in WBC is not understood. There was, however, no significant change in RBC count, packed cell volume, erythrocyte sedimentation rate, and blood clotting time. The plasma level of sodium was gradually increased with 1600 ppm treatment and the maximal rise of the order of 9.51 m eq./l.was noticed on 30th day of treatment. The values remained elevated even after stopping the treatment. There was, however, no adverse effect on plasma levels of potassium. The possible pharmacodynamic for the increase in plasma level of sodium has been explained due to the stimulation of aldosterone secretion as a result of reduction in cardiac output produced by anticholinesterase (malathion) agents. (Author abstract by permission)

73-1187. Mestitzova, M.; Kovac, J.; Durcek, K.; Hladka, A. (Vyskumny ustav hygieny prace a chorob z povolania, Bratislava, Czechoslovakia). **Toxicita organofosfatu (fenitrotion) u potkanov chronicky otravenych chloroganickym insekticidom (heptachlor). [Toxicity of an organophosphate insecticide (fenitrothion) in rats chronically poisoned with an organochlorine (heptachlor).]** *Prac. Lek. 22(10): 361-365; 1970.* (26 references) (Slovak)

The metabolic interaction of an organochlorine insecticide (heptachlor) and an organophosphate (fenitrothion) was investigated on rats. One group of rats was chronically poisoned with heptachlor at a rate of 5 mg/kg/day for three months. These rats and a control group were then fed single acute and subacute doses of fenitrothion dissolved in oils. Fenitrothion acute toxicity underwent a change in the group pretreated with heptachlor. Heptachlor-treated animals displayed increased mortality at doses below LD50 (1580 mg/kg); at doses above LD50 this effect was less apparent. In addition to the increased toxicity, the intensity and duration of symptoms (perspiration, exophthalmos, hemodacryorrhea) was also enhanced. The formation of

metaoxon, the principal toxic metabolite of fenitrothion was studied after a single administration of 74 mg/kg ^{32}P-fenitrothion by determination of the oxon/fenitrothion ratio in the liver and the blood. Production of the oxon analog was increased in the group pretreated with heptachlor. The urinary excretion of *p*-nitro-*m*-cresol after administration of 50 mg/kg fenitrothion was also significantly increased in the heptachlor pretreated group with maximal excretion reached after three hours. The results may be due to induction of microsomal enzymatic activity by heptachlor.

73-1188. Tews, L. L. (Biol. Dept., Univ. of Wisconsin, Oshkosh, WI). **The effects of selected fungicides and soil fumigants upon the microfungi of a cattail marsh.** *Proceedings of the Conference on Great Lakes Research, 14th, University of Toronto, 1971, pp. 128-136.* (6 references)

Field concentrations of six commonly used fungicides (captan, Dexon, Dithane (mancozeb), Terrachlor (PCNB) thiram, and zineb) and two soil fumigants (Vapam (metham) and Vorlex) were tested on cultures of microfungi predominant in a cattail marsh. The growth of all four fungi was completely arrested by captan, Vapam, and Vorlex. In several instances the fungicides stimulated the growth of some fungi. In a field study, Vapam and Vorlex significantly reduced the number of microfungal propagules in the litter, water, and mud of the marsh while captan, Terrachlor, or thiram did not. Results of the study were inconclusive, but an interesting finding was the recoverability of the microfungal flora observed in field situations.

73-1189. Huang, C. C. (Springville Lab. of Roswell Park Mem. Inst., Springville, NY 36952). **Effect on growth but not on chromosomes of the mammalian cells after treatment with three organophosphorus insecticides.** *Proc. Soc. Exp. Biol. Med. 142(1): 36-40; 1973.* (5 references)

Malathion, methyl parathion, and disulfoton inhibited the growth of three human hematopoietic cell lines at the lowest concentrations tested (23 or 50 μg/ml). After removal of the medium containing insecticide the normal growth rate was usually resumed. No increase in the incidence of metaphases with chromosome aberrations was observed over that in negative controls. Methyl parathion at 5, 10, 20, 50, and 100 mg/kg did not increase the incidence of cells with chromosome aberrations in the bone marrow of ICR mice. These insecticides should be tested in other systems before assessing their mutagenic potential.

73-1190. Shubik, P. (Eppley Inst. for Res. in Cancer, Univ. of Nebraska, Omaha, NB 68105). **The use of the Syrian golden hamster in chronic toxicity testing.** *Progr. Exp. Tumor Res. 16: 176-184; 1972.* (14 references)

The hamster has potential use in the study of organochlorine-induced carcinogenesis. Experiments have demonstrated hamster's usefulness in testing aromatic amines, polycyclic hydrocarbons, and other compounds which might cause pulmonary carcinogenesis. Results of a comparative metabolic study in the mouse, rat, and hamster fed DDT and further experiments on organochlorine-induced tumors are needed to resolve differences obtained in results with chlorinated hydrocarbons. Carbon tetrachloride gave rise to a high incidence of hepatomas while acetylaminofluorene caused only cholangiomas in hamsters. However, a series of organochlorines was tested with negative results and in this study carbon tetrachloride did not yield the same unequivocal results. Another study also yielded negative results with doses of DDT known to cause hepatomas in the mouse.

73-1191. Hadani, A.; Ziv, M.; Shimshony, A. (Kimron Vet. Inst., Bet Dagan, Israel). **Intoxication in sheep following dipping in a benzene hexachloride (BHC) emulsion.** *Refuah Vet. 29(3): 122-126; 1972.* (5 references)

The first 50 of 150 sheep dipped in a BHC emulsion prepared with xylene showed signs of toxicity, such as salivation, nervousness, steeruping, muscular twitching, staggering, stumbling, or collapse. Sheep dipped in the xylene emulsion alone had similar, but less pronounced symptoms, suggesting that xylene was the toxic agent but that BHC had a synergistic effect. Bioassay and chemical analysis of the dip (presumably a measure of insecticide and solvent concentrations) indicated no more than a 10% depletion between first and last dipping in the 1968 study and no depletion in the 1969 study. On the basis of the results obtained, depletion of the solvent and insecticide or breakdown of the emulsion are not the cause of the typical pattern of toxicity of BHC dipping in which the first 50 or 60 sheep are affected. It has been suggested that the xylene vapors created initially around the top of the container could be responsible and the use of a wettable powder BHC formulation is recommended.

73-1192. Baquar, S. R.; Khan, N. R. (Cytogenetics Sec., Cent. Lab., P.C.S.I.R., Karachi, Pakistan). **Effect of γ-hexachlorocyclohexane (HCCH) on the mitotic cells of *Pisum sativum* L.** *Rev. Biol. (Lisbon) 7(3-4): 195-202; 1970.* (16 references)

The effects of 24 hr exposure to a 250 ppm emulsion of lindane (γBHC) on root cells of *Pisum sativum* L. were investigated. Lindane induced the formation of binucleate and multinucleate cells which probably originate from the bipolar and multipolar mitosis, respectively. A synchronization of nuclear division in binucleate cells, aside from occasional partial or diagonal cell plate formation, was noted. The chemical appeared to block the spindle formation and hinder the movement of chromosomes toward the poles, resulting in the occurence of polyploid cells up to the hexaploid level.

73-1193. Yomura, Y.; Shibata, N.; Hashimoto, K. (Kanto Rosai Hospital, Kawasaki, Japan). **[On the effect of methyl bromide fumigation on pantothenic acid and its relationship to SMON.]** *Rinsho Shinkeigaku (Clin. Neurol.) 12(12): 631; 1972.* (Japanese)

Chronic symptoms similar to those of SMON (subacute myelo-optic neuropathy) were observed in a case of methyl bromide intoxication after the remission of acute toxic symptoms. White rats were fed a commercial solid diet fumigated with methyl bromide for 48 hr. Although no residues of methyl bromide were detected, discoloration and stiffness of hairs and skins, diarrhea, soft feces, lassitude and limpness, inhibition of body weight gain, abnormal behavior, and ataxia occurred. Many of them died in a weakened condition. Denaturation of axon and medullary sheath of peripheral nerves and demyelinization of posterior funiculus were found by histological examination during autopsy. IR analysis indicated that pantothenic acid changed to another compound from methyl bromide fumigation. Fumigated pantothenic acid orally administered to rats at 0.1, 5, and 25 mg/day/head, produced similar but not as serious symptoms as rats fed the fumigated diet.

73-1194. Poland, A.; Glover, E. (Dept. of Pharmacol. and Toxicol., Univ. of Rochester Sch. of Med. and Dentistry, Rochester, NY 14642). **2,3,7,8-Tetrachlorodibenzo-p-dioxin: A potent inducer of δ-aminolevulinic acid synthetase.** *Science 179(4072): 476-477; 1973.* (21 references)

2,3,7,8-Tetrachlorodibenzo-*p*-dioxin, a toxic contaminant frequently formed during the synthesis of the herbicide 2,4,5-trichlorophenoxyacetic acid, was shown to be a potent inducer of hepatic δ-aminolevulinic acid synthetase in the chick embryo. As little as 4.66×10^{-12} mole of the contaminant per egg produces a significant increase in the activity of the enzyme. Induction of the enzyme is related to the dose of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin and, in contrast to that produced with other drugs, is prolonged in time with 70 percent of the maximum induced activity present five days after a single dose. This contaminant is implicated as the likely causative agent in an outbreak of porphyria cutanea tarda in workers in a factory where 2,4,5-trichlorophenoxyacetic acid was being synthesized. (Author abstract by permission. Copyright 1973 by the American Association for the Advancement of Science)

73-1195. Burge, W. D. (U.S. Dept. of Agr., Beltsville, MD 20705). **Microbial populations hydrolyzing propanil and accumulation of 3,4-dichloroaniline and 3,3′4,4′-tetrachloroazobenzene in soils.** *Soil Biol. Biochem. 4(4): 379-386; 1972.* (12 references)

Propanil was 30 to 60% hydrolyzed to DCA (3,4-dichloroaniline) within 2-4 hr in all five of the soils tested; 4-35 days were required to completely hydrolyze the herbicide. The rate of hydrolysis was not related to soil texture or organic matter. DCA accumulated and disappeared with time, but was still present on the 83rd day. TCAB (3,3′4,4′-tetrachloroazobenzene) appeared in small amounts and was still present after 280 days of incubation, but the amount was not large enough to account for the disappearance of DCA. Large numbers of propanil-decomposing *Arthrobacter* and *Nocardia* spp. were found in the soils, but no DCA-metabolizing microorganisms were detected. No degradation was observed in heat-treated or PCMC-treated soils, and a filterable propanil-hydrolyzing factor was extracted from soils by sonication, suggesting intracellular enzymatic activity.

73-1196. Mandzhgaladze, R. N.; Vashakidze, V. I. (Inst. Hyg. Occup. Dis., Min. Pub. Health, Georgian SSR). **Deystviye khimicheskikh soyedineniy na potomstvo i razvitiye priznakov pola. [Action of some chemical compounds on offspring and sexual characteristics of rats.]** *Soobshch. Akad. Nauk Gruz. SSR 65(2): 485-488; 1972.* (4 references) (Russian)

Effects of 1/200, 1/500, and 1/1,000 LD50 doses of granosan, carbaryl, manganese chloride, potassium permanganate, captan, and phthalan on the general and sexual development of treated white rats and their offspring were studied. Inhibition of the activity of the male gonads in the early meiotic stage, reduced spermatogonial count, reduced rate of pituitary gonadotropic hormone secretion, inhibition of spermatozoid redox processes, and decreased motility of the spermatozoids were observed. Granosan and carbaryl interfered with oogenesis and the estrous cycle, respectively. The functional changes produced and the specificity of the compounds tested did not always correlate with the acute toxicity. Carbaryl exerted a direct gonadotoxic effect while granosan affected primarily the nervous and endocrine systems. Increased postnatal mortality, accelerated sexual development, reduced weight gain, and increased sensitivity to the previously administered compounds were found in the offspring. Inhibition of cholinesterase and transaminase activities and chromosomal aberrations were also observed.

73-1197. Cranmer, M. F.; Peoples, A. J. (Environ. Protect. Agency, Perrine, FL). **Evaluation of normal and organophosphate and carbamate insecticide inhibited blood cholinesterase activity utilizing dimethylbutyl-acetate as a substrate.** *Toxicol. Appl. Pharmacol. 22(2): 285-286; 1972.*

The availability of an extremely sensitive and precise gas chromatographic method for the analysis of human blood cholinesterase led to the attempt to apply this method to common laboratory animals where analysis of limited blood samples is important. Of particular importance was the comparison of plasma activities since the plasma of different species vary greatly in esterase profiles. In addition to the need to compare

activities obtained with dimethylbutylacetate to those expected with standard methods utilizing acetylcholine was the requirement to compare activities resulting after the administration of an anticholinesterase pesticide. Normal and inhibited blood cholinesterase values are presented for weanling and mature rats, mice, and rabbits and for mature Rhesus and squirrel monkeys. The inhibited samples were analyzed 30 min after the animals were given a po dose of parathion and carbaryl equivalent to one fourth of the LD50. The results demonstrate DMBA to be acceptable as a cholinesterase substrate both for the determination of normal and inhibited activities in all species except the mouse where high levels of nonspecific plasma esterases complicate interpretation. (Author abstract by permission) (Eleventh Annual Meeting, Society of Toxicology, Williamsburg, March 5-9, 1972. Abstract No. 28)

73-1198. Palazzolo, R. J.; Fancher, O. E.; McCarthy, J. F.; Calandra, J. O. (Industrial Bio-Test Laboratories, Inc., Northbrook, IL). **Cholinesterase inhibition studies in man with Ethion.** *Toxicol. Appl. Pharmacol. 22(2): 286; 1972.*

The minimum effect dose (MED) for cholinesterase inhibition was determined for Ethion (ethyl methylene phosphorodithioate) in human volunteers using an increasing dose procedure. Following a pretreatment period for determination of baseline plasma and erythrocyte cholinesterase activity, the subjects were treated on a tid po schedule at a dose level (mg/kg) corresponding to a fraction of the maximum no-effect level previously determined in rats and dogs. The dose level was increased incrementally at 3 wk intervals until an effect on plasma and/or erythrocyte cholinesterase activity was observed. Although each subject served as his own control, simultaneous placebo controls were also employed. A minimum effect level of 0.10 mg/kg was determined for Ethion. (Author abstract by permission) (Abstract No. 29)

73-1199. McPhillips, J. J.; Foley, D. J. (West Virginia Univ., Morgantown, WV). **Effect of acute and subacute inhibition of cholinesterase on the response of the rat uterus to cholinergic drugs.** *Toxicol. Appl. Pharmacol. 22(2): 286; 1972.*

The rat uterus, in contrast to the ileum, does not exhibit diminished sensitivity to carbachol following subacute administration of disulfoton. This may be the result of sparse cholinergic innervation of the rat uterus and a low cholinesterase content. Inhibition of the enzyme, therefore, may not be accompanied by measurable changes in the sensitivity of this organ to drugs. In the present study the cholinesterase content of the uterus was compared to that of the ileum. In addition the effects of acute and subacute inhibition of cholinesterase on the sensitivity to cholinergic drugs was also measured. The uterus hydrolyzes acetylcholine (ACh) at a rate of 25.6 μmol/g of protein/hr, whereas the ileum hydrolyzes ACh at a rate of 172.0 μmol/g of protein/hr. Methacholine is hydrolyzed at a rate of 1.8 μmol/g of protein/hr by the uterus and at a rate of 9.0 μmol/g of protein/hr by the ileum. A dose of 1.0 mg/kg of disulfoton/day for 8 days caused a 63% reduction in the hydrolysis of ACh by the ileum. This was accompanied by subsensitivity to carbachol and an increased sensitivity to ACh. The ED50 of ACh decreased from 0.64 to 0.32 μmol/l. In the uterus there was a 58% reduction in ACh hydrolysis. The sensitivity of the uterus to both ACh and carbachol was unchanged. A single dose of disulfoton, 1.5 mg/kg, produced 65% inhibition of ACh hydrolysis in the ileum. The sensitivity to ACh was increased. The same dose of disulfoton produced a 67% decrease in ACh hydrolysis in the uterus, but there was no change in the sensitivity of the uterus to ACh. Inhibition of the cholinesterase of the uterus, therefore, does not affect the response of the tissue to cholinergic drugs. (Author abstract by permission) (Abstract No. 30)

73-1200. Foley, D. J.; McPhillips, J. J. (West Virginia Univ., Morgantown, WV). **Relationship between cholinesterase activity and sensitivity to cholinergic drugs in the rat ileum.** *Toxicol. Appl. Pharmacol. 22(2): 286; 1972.*

Repeated administration of disulfoton, an organophosphate cholinesterase inhibitor, produces a decrease in the sensitivity of the rat ileum to carbachol. In the present study experiments were designed to determine the onset and duration of reduced sensitivity to carbachol in female rats. At the same time the hydrolysis of acetylcholine (ACh) and methacholine (MeCH) was measured in segments of ileum from the same rats. Twenty-four hours after the first dose of disulfoton, there was no change in the sensitivity of the ileum to carbachol. Hydrolysis of ACh was reduced 36% and MeCh hydrolysis was reduced 40%. After two days of treatment there was a slight decrease in the sensitivity of the ileum to carbachol. The ED50 of carbachol increased from 0.32 to 0.50 μmol/l.($P<0.05$). The hydrolysis of ACh was reduced 76% and the hydrolysis of MeCh 45%. After four days of treatment, the ED50 of carbachol increased from 0.29 to 0.78 μmol/l. and after eight days the ED50 had increased from 0.26 to 0.96 μmol/l. However, the maximum change in sensitivity occurred at four days since there was no difference between the changes in sensitivity at four and eight days. After four days of treatment hydrolysis of ACh was inhibited 66% and MeCh hydrolysis 59%. Reduced sensitivity to carbachol was still present five days after subacute treatment with disulfoton was stopped. Hydrolysis of ACh and MeCh, however, was essentially normal two days after treatment was stopped. Changes in the sensitivity of the ileum, therefore, do not seem to be directly related to the degree of cholinesterase inhibition. (Author abstract by permission) (Abstract No. 31)

73-1201. Hemsworth, B. A.; Cholakis, J. M. (Univ. of Rochester Sch. of Med., Rochester, NY). **Some actions of a new organophosphorus compound and one of its major metabolites at the neuromuscular junction.** *Toxicol. Appl. Pharmacol. 22(2): 287; 1972.*

The organophosphorus insecticide, *O,O*-dimethyl-*S*- [(2-methoxy-1,3,4-thiadiazol-5(4*H*)-on-4-yl)-methyl]-dithiophosphate (GS 13005), inhibits both acetylcholinesterase and cholinesterase in vivo. Indirectly elicited contractions of the cat tibialis muscle are initially potentiated by iv injections (30 mg/kg) of the anticholinesterase. High frequencies of nerve stimulation eventually block the muscle contractions, and it has been suggested that in addition to its anticholinesterase action the insecticide may have an effect on the motor nerve terminal. In vitro, GS 13005 caused an inhibition of acetylcholine (ACh) synthesis by an action on the enzyme choline acetyltransferase (ChAc), and the anticholinesterase was found to inhibit the uptake of choline into nerve ending particles (synaptosomes). The major degradation of GS 13005 in plants is via the oxygenated metabolite GS 13007. This metabolite is a more effective anticholinesterase in vitro than GS 13005 but has no effect on ACh synthesis or choline uptake. It is suggested that in vivo GS 13005 may affect ACh synthesis, thus modifying the amount of transmitter released from the motor nerve terminal and affecting neuromuscular transmission. (Author abstract by permission) (Abstract No. 33)

73-1202. Norman, B. J.; Neal, R. A. (Vanderbilt Univ., Nashville, TN). **Comparison of the metabolism of parathion with the amounts of high spin and low spin cytochrome P-450 in various sub-fractions of rabbit and rat liver microsomes.** *Toxicol. Appl. Pharmacol. 22(2): 287-288; 1972.*

The metabolism of parathion to paraoxon and to diethylphosphorothioic acid plus *p*-nitrophenol are apparently catalyzed by two different mixed function oxidase enzyme systems. One evidence for this is induction of the mixed function oxidase enzymes of rat liver by 3,4-benzopyrene stimulates the metabolism of parathion to paraoxon to a greater extent than to diethylphosphorothionate plus *p*-nitrophenol. [*sic*]. It has also been shown that induction of the mixed function oxidase enzymes with 3,4-benzopyrene and other polycyclic hydrocarbons selectively induces the amount of high spin cytochrome P-450 in hepatic microsomes. We therefore undertook studies in which we compared the amount of high spin and low spin P-450 in various samples of microsomes and subfractions of microsomes with the ability of these microsomal fractions and subfractions to metabolize parathion to paraoxon and to diethylphosphorothioic acid. The purpose of these studies was to determine if high spin P-450 was selectively catalyzing paraoxon formation. The results of these experiments indicate there is no direct relationship between the amount of high spin P-450 in a particular sample of microsomes and the ability of these microsomes to metabolize parathion to paraoxon. (Author abstract by permission) (Abstract No. 34)

73-1203. Stevens, J. T.; Stitzel, R. E.; McPhillips, J. J. (West Virginia Univ., Morgantown, WV). **Enhancement of aniline metabolism by paraoxon.** *Toxicol. Appl. Pharmacol. 22(2): 288; 1972.*

During a series of experiments, it was observed that paraoxon, in contrast to most other anticholinesterase agents, enhanced the in vitro metabolism of aniline. This study examines that observation in more detail. Paraoxon, when added to microsomal preparations at concentrations greater than 2×10^{-5} *M*, enhanced the *para* hydroxylation of aniline. This effect was observed in hepatic microsomal preparations of the mouse, rat, rabbit, and dog. Enhancement of aniline metabolism could also be produced by pretreating mice with paraoxon. Mice were given 1/2 LD50 of paraoxon po and sacrificed 1 hr later. The in vitro metabolism of aniline was found to be increased 20-30% in livers which were taken from these mice. Although the addition of paraoxon to microsomal preparations enhanced aniline metabolism, the side chain oxidation of hexobarbital and the *N*-demethylation of ethylmorphine were inhibited. *p*-Nitrophenol, a major metabolite of paraoxon, was also found to have some enhancing properties. (Author abstract by permission) (Abstract No. 35)

73-1204. Baeza, C.; Goldberg, A. M.; Rubin, R. J. (Johns Hopkins Univ. Sch. of Med. and Pub. Health, Baltimore, MD). **Effect of carbon monoxide on response to parathion and paraoxon.** *Toxicol. Appl. Pharmacol. 22(2): 288; 1972.*

Inhalation of carbon monoxide (CO) has been shown to prolong the in vivo response to drugs by inhibiting the hepatic enzyme system responsible for their inactivation. Since this same CO-sensitive enzyme system is responsible for the metabolism of parathion to its toxicologically active form, paraoxon, it became of interest to study the effects of CO in the in vivo response to parathion. Parathion (10 mg/kg ip) produced a 50% reduction in red blood cell cholinesterase after 1 hr in rats maintained in room air. Prior equilibration of rats for 90 min in various levels of CO resulted in a concentration-related inhibition of the anticholinesterase effect, with complete reversal occurring at 1000 ppm CO. At 42 mg/kg ip, parathion resulted in a mean time to death of 58.6 min in animals maintained in room air. Exposure to CO resulted in a concentration-related prolongation of time to death, such that at 1500 ppm CO the mean time to death was 129.3 min. It was also observed that a lowered inspired O_2 concentration produced effects qualitatively like those seen with CO. In rats maintained in room air, paraoxon at 1.06 mg/kg ip produced neither deaths nor signs commonly associated with cholinesterase inhibition. At 1000 ppm CO, this

same dose of paraoxon resulted in specific signs in 80% of the animals and death in 40%. Paraoxon, at 1.42 mg/kg ip, resulted in signs of intoxication in all rats maintained in room air, but no deaths were observed. In the presence of 2500 ppm CO, 70% of the animals given this dose of paraoxon died. This level of CO alone was not lethal to control animals. As with parathion, lowering the inspired O_2 concentration produced effects on the response to paraoxon similar to those seen with CO. These data indicate that CO or lowered inspired O_2 cause a decreased and/or delayed response to parathion. These results are consistent with a decreased rate of metabolic activation of parathion. The total response, however, is complicated by the demonstrated concomitant enhancement of paraoxon toxicity. (Author abstract by permission) (Abstract No. 36)

73-1205. Hartgrove, R. W.; Petrella, V. J.; Webb, R. E. (Virginia Polytechnic Inst. and State Univ., Blacksburg, VA). **Microsomal activity in endrin susceptible and resistant pine mice.** *Toxicol. Appl. Pharmacol. 22(2): 298; 1972.*

Studies were conducted to characterize hepatic microsomal oxidase activity in endrin susceptible and resistant pine mice. Endrin resistant mice showed a greater capacity to metabolize ^{3}H-benzpyrene (^{3}HBP) as evidenced by kinetic properties developed from initial velocity studies for ^{3}HBP disappearance in the microsomal fraction. The ^{3}HBP-hydroxylase activity of first generation resistant offspring indicated that the higher hydroxylase activity of resistant mice is heritable. Further, the kinetic properties of BP-hydroxylase were determined for 2-,4-,6-, and 8-wk-old first generation offspring of the two strains. These studies showed that the rate of development of the microsomal BP-hydroxylase activity was faster in the resistant strain and that both strains showed adult level kinetic properties at 8 wk of age. A comparison between strains of ethylmorphine (EM) metabolism has indicated that endrin resistance is also correlated with EM *N*-demethylase activity in the two strains. No correlation was found with aniline hydroxylation. This indicates that endrin may be a type I substrate similar to EM. Preliminary oxygen uptake studies indicate that the resistant strain utilizes more oxygen than the susceptible, which further implicates differences in the mixed function oxidases as a factor in the strain differences noted with regard to the ability to handle endrin in the environment. (Author abstract by permission) (Abstract No. 64)

73-1206. Cohen, S. D.; Callaghan, J. E.; Murphy, S. D. (Harvard Sch. of Pub. Health, Boston, MA). **Investigation of multiple mechanisms for potentiation of malaoxon (MX) by triorthotolyl phosphate.** *Toxicol. Appl. Pharmacol. 22(2): 300; 1972.*

Potentiation of malathion (MAL) toxicity by low doses (<20 mg/kg) of triorthotolyl phosphate (TOTP) has been shown to be closely associated with TOTP-inhibition of hydrolysis of MAL by liver carboxylesterase (CE). However, MAL potentiation was observed to continue to increase with increasing doses of TOTP beyond those which produced maximum inhibition of liver CE. This suggested that an additional mechanism might be involved in TOTP potentiation of MAL toxicity. To determine if the continued increase in degree of potentiation of MAL resulted from TOTP inhibition of the detoxification of MX (the active cholinesterase-inhibiting metabolite of MAL), dose-response relationships between TOTP potentiation of MX toxicity and inhibition of tissue CE, cholinesterase (CHE) and liver inactivation of MX by binding were investigated. Groups of five male mice were injected ip with TOTP and challenged 18 hr later with selected doses of MX. They were sacrificed 5 min after challenge, and inhibition of brain CHE measured. Pretreatment with 10, 17, 50, or 125 mg/kg of TOTP resulted in 1.8-, 3.6-, 12.3-, and 31.4-fold potentiation of MX toxicity, respectively. Other groups of identically pretreated mice were sacrificed without challenge, and liver and plasma CE, liver, lung, plasma, and brain CHE, and liver inactivation of MX by binding were measured. Liver and plasma CE and plasma and lung CHE were maximally inhibited by 50 mg/kg of TOTP. In contrast, liver CHE inhibition increased from 90 to 98%, and inhibition of liver MX binding increased from 89 to 99% (both increases significant; $p < 0.05$) when the pretreatment dose of TOTP was increased from 50 to 125 mg/kg. TOTP pretreatment did not inhibit brain CHE nor alter the sensitivity of mouse brain CHE to inhibition by MX in vitro. These data suggest that the increase in degree of MX and/or MAL potentiation, observed with doses of TOTP greater than those that cause maximal inhibition of CE, may result from an additional increase in inhibition of MX binding and that liver CHE may contribute to binding of MX. (Author abstract by permission) (Abstract No. 69)

73-1207. Chadwick, R. W.; Freal, J. J. (Environmental Protection Agency, Perrine, FL). **The identification of five unreported lindane metabolites recovered from rat urine.** *Toxicol. Appl. Pharmacol. 22(2): 300-301; 1972.*

Though lindane has been widely applied as an insecticide since the Second World War, the metabolic fate of this compound in mammals is still unresolved. Recent data from this lab and others indicate that the metabolism of lindane in mammals is considerably more complex than was previously realized. Through an improved analytical method based on gas liquid chromatography and Coulson electrolytic conductivity detection, it has been possible to characterize five previously unreported metabolites from the urine of rats fed diets containing 400 ppm lindane. The lindane metabolites were identified as 3,4-dichlorophenol, 2,4,6-trichlorophenol, 2,3,4,5-tetrachlorophenol, 2,3,4,6-tetrachlorophenol, and 2,3,4,5,6-pentachloro-2-cyclohexen-1-ol. While the 3,4-dichlorophenol is a minor

metabolite, the others are excreted in greater quantities than either of the previously identified metabolites, 2,3,5- or 2,4,5-trichlorophenol. The excretion of the tetrachlorophenols and 2,3,4,5,6-pentachloro-2-cyclohexen-1-ol requires a revision in the currently accepted theory regarding the metabolism of lindane in mammals. (Author abstract by permission) (Abstract No. 70)

73-1208. Chadwick, R.; Peoples, A.; Cranmer, M. (Environmental Protection Agency, Perrine, FL). **The effect of ascorbic acid deficiency and protein quality on stimulation of hepatic microsomal enzymes in guinea pigs.** *Toxicol. Appl. Pharmacol. 22(2): 308-309; 1972.*

It has been established that a number of nutritional and physiological variables affect hepatic microsomal enzyme induction in mammals. Standardization of such variables will permit results between labs to have a basis for comparison. Protein quality and ascorbic acid deficiency were found to affect the storage and excretion of ^{14}C-lindane together with the stimulation of various hepatic enzyme systems in the guinea pig. Low quality dietary protein enhanced urinary but not fecal excretion of radioactivity. While radioactivity stored in the liver and fat was not significantly altered, that stored in the kidney was reduced by protein inadequacy. Ascorbic acid deficiency, on the other hand, inhibited urinary excretion of radioactivity and permitted a high level to be stored in the kidney. The dietary variables produce both qualitative and quantitative alterations in the metabolism of ^{14}C-lindane. The effect of dietary variable on pesticide induction of various in vitro enzyme systems was not clear cut. Thus while enhancing the *o*-demethylation of *o*-nitroanisole, protein inadequacy impairs the oxidative hydrolysis of EPN, the glucuronidation of *p*-nitrophenol, and exerts no definite influence over the azo reduction of methyl orange or the microsomal protein and cytochrome P450 content of the liver. While soy protein stimulates the excretion of glucaric acid, gelatin appears to inhibit it. Similarly ascorbic acid deficiency promotes glucuronyl transferase activity while depressing the *o*-demethylation of *p*-nitroanisole. These data support a possible role of dietary "stress" in the stimulation of some hepatic microsomal enzyme systems in the guinea pig. (Author abstract by permission) (Abstract No. 90)

73-1209. Greene, F. E. (M. S. Hershey Med. Cent., Pennsylvania State Univ., Hershey, PA). **Interactions of cyclodiene insecticides with components of the hepatic microsomal mixed function oxidase system from male and female rats.** *Toxicol. Appl. Pharmacol. 22(2): 309-310; 1972.*

The characteristics of aldrin (A) and heptachlor (H) epoxidation indicate that this biotransformation is catalyzed by the mixed function oxidase enzyme (MFO) system: the reaction is microsomal, requires a source of NADPH and O_2, and is inhibited by carbon monoxide. To further characterize the metabolism of these compounds, we have examined the effects of the substrates, A and H, as well as their respective epoxide metabolites dieldrin (D) and heptachlor epoxide (HE), on components and kinetic properties of the hepatic MFO system. All compounds tested bound avidly to cytochrome P450, ($Ks \approx 10^{-2}$ mM) producing a typical Type I difference spectra (absorption maxima at 390 nm and minima at 420 nm). The affinity in decreasing order was H > D > HE > A. The ability to stimulate NADPH oxidase paralleled the affinity of the compounds for cytochrome P450. The rate of reduction of cytochrome P450 by NADPH was increased from 150 to 200% above control values when either A, D, H, or HE was added to the reaction cuvette containing microsomes from male rats. However, there was no correlation with binding affinity since HE and A stimulated the rate of reduction more than did H and D. A sex difference was seen: in microsomes from female rats, affinity for cytochrome P450 and stimulation of NADPH oxidase was less, and the rate of reduction of cytochrome P450 could not be stimulated. These results indicate that cyclodiene insecticides and their epoxide metabolites produce similar effects on components of the MFO system, which are not related to the ability of the compounds to act as substrates, since neither D nor HE is metabolized to an appreciable extent by this system in rats. The ability of epoxides to inhibit the metabolism of their parent compounds in vitro may be explained by their common affinity for cytochrome P450. An additional effect via stimulation of NADPH oxidase may be important in vivo since the availability of NADPH within the cell may be rate limiting in the metabolism of foreign compounds. (Author abstract by permission) (Abstract No. 92)

73-1210. Wagstaff, D. J. (Univ. of Missouri, Columbia, MO). **Arsenic trioxide: stimulation of liver enzyme detoxication activity.** *Toxicol. Appl. Pharmacol. 22(2): 310; 1972.*

Arsenicals usually inhibit enzymatic processes. This inhibition is the basis for their toxicity. However, it was observed that detoxication activity of liver microsomal enzymes is enhanced by dietary As_2O_3. The activities of EPN detoxication and *O*-demethylation of *p*-nitroanisole were increased to 227 and 280% of control, respectively, by feeding adolescent female Holtzman rats a diet containing 1000 ppm As_2O_3 for 15 days. Hexobarbital sleep time was decreased by feeding a diet containing as little as 100 ppm arsenical. The enzyme stimulation effect of As_2O_3 was additive with that of other chemical and physical factors. There was a summation of effects of feeding 500 or 1000 ppm As_2O_3 in the same diet with 500 ppm phenobarbital. Also the effect of As_2O_3 was additive with the enzyme-stimulatory effect of exposure to cold for 15 days. Rats which survived 1 wk of eating toxic levels of As_2O_3 tended to recover during the second week. Also, severity of arsenic intoxication was decreased by phenobarbital

in the diet. (Author abstract by permission) (Abstract No. 93)

73-1211. Gallo, M. A.; Bachmann, E.; Golberg, L. (Albany Med. College, Albany, NY). **Effects of 2,6-dichloro-4-nitroaniline and its metabolites on rat liver mitochondria.** *Toxicol. Appl. Pharmacol. 22(2): 311; 1972.*

The metabolites formed from 2,6-dichloro-4-nitroaniline (DCNA, Botran, dicloran) in rodents have been reported to be 3,5-dichloro-*p*-aminophenol (DCAP) and 2,6-dichloro-*p*-phenylenediamine (DCPD), an observation confirmed in our laboratory. Studies carried out in vitro on liver mitochondria from untreated rats indicated that addition of DCNA or DCAP in solution in ethoxyethanol-ethanol (12:88, v/v) uncoupled oxidative phosphorylation and inhibited mitochondrial electron transport at concentrations of 5×10^{-5} *M* and 2×10^{-4} *M*, respectively. The uncoupling concentration of 2,4-dinitrophenol is 1×10^{-5} *M*. Concentrations of DCPD 10 times greater than that of DCNA did not uncouple oxidative phosphorylation, and addition of the solvent alone was without effect on the mitochondria. PO administration of 1000 mg/kg DCNA daily for four days to adult female rats did not influence oxidative phosphorylation of isolated mitochondria but did result in an increase in succinate-stimulated respiration. When rats were sacrificed 24 hr after 1-4 daily administrations of 1000 mg DCNA/kg, parallel increases were observed in relative liver weight, biphenyl hydroxylation, and succinate-stimulated respiration. Biphenyl hydroxylation was stimulated most powerfully by DCPD and least so by DCHA. (Author abstract by permission) (Abstract No. 97)

73-1212. Piper, W. N.; Rose, J. Q.; Gehring, P. J. (Dow Chemical Company, Midland, MI). **Metabolism of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in rats.** *Toxicol. Appl. Pharmacol. 22(2): 317; 1972.*

A definitive study of the pharmacokinetics of 2,4,5-T in animals has not been reported. The purpose of this investigation was to determine the rate of clearance of 2,4,5-T from the plasma and the rate of excretion of 2,4,5-T from rats administered single po doses of 2,4,5-T-^{14}C. Groups of three male and three female rats were given 5, 100, or 200 mg/kg of 2,4,5-T-^{14}C. Blood collected by orbital sinus puncture for up to 7 days was centrifuged and the plasma was analyzed for ^{14}C activity. Urine, feces, and expired air were collected every 24 hr and analyzed for ^{14}C activity. The half-lives for clearance of ^{14}C from the plasma and the volume of distribution increased as the dose increased. The half-life for the disappearance of ^{14}C activity from the body also increased as the dose increased. The results indicate that rate of clearance of 2,4,5-T from plasma and the body of rats decreases and that volume of distribution increases with increasing doses. (Author abstract by permission) (Abstract No. 112)

73-1213. Hart, R. E.; Valerio, M. G. (Bionetics Res. Lab., Inc., Falls Church, VA). **Teratogenic effects of 2,4,5-T in mice.** *Toxicol. Appl. Pharmacol. 22(2): 317; 1972.*

Two commercial samples of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) stated to be >99% pure were used. Solutions in propylene glycol or dimethyl sulfoxide were prepared daily and administered by sc injection at a dosage of 10 or 100 mg/kg to pregnant female CD-1 mice. Comparable volumes of the solvents were used as controls. Administration began on day 6 of pregnancy and continued through day 15. On day 18, the mice were killed, and uterine contents carefully examined grossly. Subsequent examination was by the Wilson technique for soft tissue abnormalities and after clearing and staining with Alizarin Red S for skeletal abnormalities. At the larger dose, one sample produced a marginally significant increase in incidence of cleft palate as compared with solvent controls. Other abnormalities were observed only in very small numbers and so scattered as to preclude any causal relationship to the treatment. (Author abstract by permission) (Abstract No. 113)

73-1214. Fang, S. C.; Montgomery, M. L.; Freed, V. H. (Oregon State Univ., Corvallis, OR). **The metabolism and distribution of 2,4,5-trichlorophenoxyacetic acid in female rats.** *Toxicol. Appl. Pharmacol. 22(2): 317-318; 1972.*

^{14}C-labeled 2,4,5-trichlorophenoxyacetic acid (2,4,5-T-1^{14}C) was fed po to adult rats at a dose of 0.04–10 mg per rat, and expired air, urine, feces, and internal organs, and tissues were analyzed for radioactivity. No ^{14}C was found in the expired air during a seven-day period following dosing. During the first 24 hr, 75 ± 7% of the radioactivity was excreted in the urine and 8.2 ± 4.6% in the feces. The average recoveries after seven days were 85% in the urine and 11% in the feces. Between 90 and 95% of the radioactivity in the first and second day urine samples was unchanged 2,4,5-T. There was no significant difference in the rate of elimination between rats receiving 0.04, 1, or 10 mg of 2,4,5-T. Radioactivity was found in all organs and tissues examined. The maximum concentration in all tissues was generally reached 6–12 hr after dosing and then started to decline rapidly. The highest concentration of 2,4,5-T was found in the kidneys; the next highest was in the blood, lung, heart, and liver, respectively. The average biological half-life of 2,4,5-T in the blood and vital organs was 3.5 hr. Very little radioactivity remained in the organs after three days. The excretion and tissue distribution of 2,4,5-T after multiple doses in pregnant rats were also investigated. (Author abstract by permission) (Abstract No. 114)

73-1215. Weil, C. S.; Woodside, M. D.; Bernard, J. B.; Condra, N. I.; Carpenter, C. P. (Carnegie-Mellon Univ.,

Pittsburgh, PA). **Studies on rat reproduction and guinea pig teratology of carbaryl fed in the diet vs. stomach intubation.** *Toxicol. Appl. Pharmacol. 22(2): 318; 1972.*

These studies were undertaken to ascertain if differences in effect of carbaryl on reproduction and teratology were related to the two modes of po administration: gastric intubation or dietary feeding. Following repeated intubation, reduced reproduction of rats had been reported at low dose levels and teratology was reported in guinea pigs at an extremely high level. Randomized groups of rats were, therefore, concurrently presented daily doses of carbaryl by gastric intubation or by dietary inclusion. Each parental generation was bred three times during a year of dosing, and the F1a generation bred to produce the F2. The F2 rats, in turn, were bred to produce F3a rats which were killed for micropathological examination; to produce F3b fetuses for teratological study; and for a dominant-lethal test. Currently, the primary differences seen include signs of cholinesterase-inhibition and deaths in the highest intubation level of 100 mg/kg/day, as contrasted to no symptoms or mortality at 200 mg/kg *[sic]*. No consistent reproductive effects have been seen in any group of rats, as contrasted to previous reports by the Soviets of reduced reproduction at 5 mg/kg. Guinea pigs were similarly dosed by gastric intubation or by inclusion of carbaryl in their diets on selected days of their gestation period during organogenesis. While some skeletal and visceral abnormalities previously had been reported at the 300 mg/kg LD50 level following intubation, no gross abnormalities were found in this concurrent study from dose levels as high as 200 mg/kg by gastric intubation or from 300 mg/kg in the diet. These concurrent studies demonstrate for carbaryl the differences in results seen between gastric intubation and dietary administration and likewise the dose-related incidence of teratology, if and when it is found. (Author abstract by permission) (Abstract No. 115)

73-1216. Whitcomb, E. (Environmental Protection Agency, P.O. Box 490, Perrine, FL). **The action of pesticides on conduction in the rat superior cervical ganglion preparation in vitro.** *Toxicol. Appl. Pharmacol. 22(2): 324; 1972.*

The findings of some investigators have suggested that DDT is capable of altering the stability of the nerve fiber. The present experiment was designed to determine if DDT, carbaryl, and chlordane could alter the propagated action potential in the nerve fiber and at the synapsis using the superior cervical ganglion preparation of the rat. The in vitro recording from nontreated animals had the following characteristics: preganglionic nerve fibers membrane requiring approximately 400 msec for 100% recovery; no evidence of spontaneous preganglionic firing; no synchronized firing of postganglionic fibers via stimulation of the preganglionic nerve. Carbaryl and chlordane alter the control pattern by shortening the recovery time. DDT lengthened the recovery time. The lengthened recovery time and absence of spontaneous firing in preparations from DDT-treated animals would not implicate peripheral nerve components as a source for tremors seen in the intact treated animals. (Author abstract by permission) (Abstract No. 131).

73-1217. Thomas, J. A.; Smith, M. T.; Mawhinney, M. G.; Smith, C. G.; McPhillips, J. J. (West Virginia Univ. Med. Cent., Morgantown, WV). **Actions of dieldrin on the uptake of testosterone-1,2-H^3 by prostate glands of the male mouse.** *Toxicol. Appl. Pharmacol. 22(2): 326-327; 1972.*

Male mice were treated with varying po doses of dieldrin for periods up to 10 days. An po regimen of 1.25, 2.5, or 5 mg/kg of this organochloride caused decreases in the prostatic uptake of radioactive testosterone. The highest dose (5 mg/kg daily × 10) caused a 42% reduction in the assimilation of radiosteroid ($P \leq 0.05\%$). Lower dose regimens were not as effective in lowering androgen uptake by the prostate gland. While the chronic administration of dieldrin (10-day dose schedule) led to reductions in prostatic uptake of testosterone-1,2-H^3, acute administration (2 hr) produced an increase in the assimilation of radiosteroid. This transient increase in the uptake of radiosteroid by dieldrin did not appear due to increased target organ protein metabolism since both pesticide-treated groups and control mice demonstrated similar incorporation rates of leucine-^{14}C. Preliminary studies with the herbicide 2,4,5-T revealed that it too may alter the assimilation of radiosteroid in male accessory glands of reproduction. This organochloride failed to alter testicular weights. (Author abstract by permission) (Abstract No. 138)

73-1218. McLachlan, J. A.; Dixon, R. L. (National Cancer Inst., Bethesda, MD). **Gonadal function in mice exposed prenatally to *p,p'*-DDT.** *Toxicol. Appl. Pharmacol. 22(2): 327; 1972.*

It has been recently reported that DDT treatment during the neonatal period results in the persistent estrous syndrome and sterility in the adult female rat. Previous experiments have shown that exposure to DDT during the preimplantation stages of pregnancy resulted in retarded fetal growth. The current study was undertaken to evaluate the effects of prenatal treatment with this common pesticide on the reproductive capacity of the offspring. Pregnant Swiss-Webster mice were given *p,p* -DDT (1 mg/kg) on days 10, 12, and 17 of gestation. At varying intervals postpartum representative male and female offspring were sacrificed, and the ovaries, testes, adrenals, and pituitaries processed for histolopathological examination. The onset of puberty was determined for the remaining newborn, and the estrous cycles of the females monitored. When the treated offspring attained puberty, their reproductive capacity was evaluated. Fertility, forced breeding performance, birth intervals, fertility span, litter sizes, and lordosis

quotients were determined for the treated female offspring. The fertility profiles of the males were obtained by serial mating techniques. The DDT treatment did not exert any gross teratogenic effect. The cellular components of the gonads were more significantly altered in the prenatally treated female offspring than in the corresponding males. Likewise, the decrease in fertility was more marked in the female. These results suggest that the functional status of the gonads may be altered in mice exposed prenatally to DDT. (Author abstract by permission) (Abstract No. 139)

73-1219. Smith, M. T.; Thomas, J. A.; Smith, C. G.; Mawhinney, M. G.; McPhillips, J. J. (West Virginia Univ. Med. Cent., Morgantown, WV). **Localization of DDT-^{3}H in male reproductive organs and its actions upon androgenic function.** *Toxicol. Appl. Pharmacol. 22(2): 327; 1972.*

Single po doses of radioactive DDT administered to male mice produced significant amounts of tritium in several organs of reproduction. The prostate glands and the testes contained very high amounts. Labeled DDT or its metabolites was also found in the seminal plasma. Residual amounts of radioactivity were detected in epididymal fat pads as long as 12 days after the single administration of DDT-^{3}H. Nonreproductive tissues such as the liver, kidney, and the adrenal gland also exhibited amounts of labeled pesticide or its metabolites. Ingestion of DDT (12.5, 25, or 50 mg/kg daily X 10) caused a decrease in the ability of the prostate gland to assimilate testosterone-1,2-^{3}H. This decrease in androgen uptake by prostatic tissue did not seem due to the reported inherent estrogenicity of DDT. The localization of DDT in sex accessory organs of the male mouse is correlated with altered androgenic activity. (Author abstract by permission) (Abstract No. 140)

73-1220. Copeland, M. F.; Cranmer, M. F. (Environmental Protection Agency, Perrine, FL). **Effects of *o,p'*-DDT on the adrenal cortex of the beagle.** *Toxicol. Appl. Pharmacol. 22(2): 328; 1972.*

The purpose of this study was to investigate the influence of the continued po administration of *o,p'*-DDT on the adrenal cortex of the beagle. Four of eight males received *o,p'*-DDT (50 mg/kg/day) dissolved in corn oil and administered in gelatin capsules; four received corn oil only. Plasma sodium, potassium and 17-hydroxycorticosteroids (17-OHCS), as well as hematocrit and circulating eosinophils, were determined before and after iv administration of 40 units of ACTH on each dog at intervals during the 32 days of treatment. After 32 days the animals were necropsied, and histological studies were performed on the adrenals of all dogs and adrenal 17-OHCS levels determined. GLC determinations were made of *o,p'*-DDT and its metabolites in adrenal, liver, testis, and adipose tissue. The treated dogs maintained body weights comparable to those of the controls, though treated dogs showed a decreased eosinopenic response to ACTH after day 16, when compared to controls. Two-way classification analysis of variance showed no significant difference at $p < 0.05$ in the 17-OHCS response to ACTH nor within group variation between treated and control dogs. There was no significant difference at $p < 0.05$ in plasma sodium and potassium levels, nor in the hematocrit in the treated as compared to controls before or 4 hr after ACTH on any of the test days, nor in the adrenal 17-OHCS levels at the conclusion of the experiment. The adrenals of the treated dogs were significantly larger ($p < 0.01$) than those of the controls. Histological studies showed cells in the fasciculata of the treated dogs to be larger, more vacuolated, and devoid of acidophilic cytoplasm with hyperchromatic nuclei, which frequently occupied a peripheral position in the cell. Of the tissues analyzed only fat contained a higher level of *o,p'*-DDT than the adrenals in treated dogs. Results from this study suggest that *o,p'*-DDT does not block the synthesis of corticosteroids by the adrenal cortex in the beagle as does *o,p'*-DDD (TDE). (Author abstract by permission) (Abstract No. 142)

73-1221. Killeen, Jr., J. C.; Griffin, T. B. (Albany Med. College, Albany, NY). **Inhibition studies of carboxyesterase activity.** *Toxicol. Appl. Pharmacol. 22(2): 329; 1972.*

The inhibitory effects on carboxyesterase activity exercised by po administered *O,O*-dimethyl-*O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate (I), its oxygen analog (II), and *O,O*-diethyl-*O*-(3,5,6-trichloro-2-pyridyl) phosphorothioate (III) were examined in animals. Carboxyesterase and cholinesterase activities were determined using automated pH stat methods. Optimum conditions for determination of carboxyesterase activity in red cells, plasma, brain, and liver were established, using triacetic tributyrin, methyl butyrate, and other esters as substrates. Eserine was employed at a concentration suitable for distinguishing between carboxyesterase and cholinesterase activities. Studies in female Sprague-Dawley rats demonstrated that I or III given po for 15 days inhibited liver esterase activity in lower concentrations than were required to inhibit cholinesterase and carboxyesterase activities of red cells, plasma, and brain; III was the more potent esterase inhibitor. A single dose of II which elicited no inhibition of cholinesterase activity, reduced esterase activity in both liver and plasma. Further studies in rats which had received po 1.0 mg/kg of I for 15 days disclosed that reduction in liver esterase activity was primarily due to decrease in hydrolytic activity of an eserine-sensitive esterase; there was less marked inhibition of the eserine-insensitive component. These studies demonstrate that the nature of esterase activity in rat liver, with regard to eserine sensitivity, is different from that of the plasma, and substantiates the view that liver esterases are more sensitive than brain or blood cholinesterase to po-administered

organophosphates. (Author abstract by permission) (Abstract No. 144)

73-1222. Farb, R. M.; Cain, J. A.; Moore, B. G.; Hayes, A. W. (Univ. of Alabama, University, AL). **Response of neonatal rats to mycotoxins and insecticides.** *Toxicol. Appl. Pharmacol. 22(2): 331; 1972.*

There is little information on the interaction of mycotoxins and pesticides in young animals or their effect on the offspring of exposed mothers. Studies, therefore, were initiated to compare day-old, 14- and 21-day animal responses to mycotoxins (aflatoxin, ochratoxin, rubratoxin) and to pesticides (aldrin, chlordane, dieldrin, DDVP (dichlorvos)). Various concentrations and combinations of the agents were administered by stomach tube to neonates, 14- or 21-day Sprague-Dawley rats. Daily weight gains, mortality, liver:body ratios and blood chemistry were monitored. The adult-neonate LD50 ratios were aldrin, 1.2; DDVP, 2.4; dieldrin, 3.4; ochratoxin, 6.5; and rubratoxin, 49.2. Rubratoxin (5.0 mg/kg) administered at day 1 followed by aflatoxin (4.0 mg/kg) at day 15 caused a reduction in average weight gains, whereas the reverse did not. Similar results were obtained with DDVP-aldrin and chlordane-dieldrin. The mortality rate of day-old rats given simultaneously po doses of rubratoxin (5.0 mg/kg) and ochratoxin (2.0 mg/kg) was greater than either compounds alone. There was a 36% increase in WBC of rats treated with rubratoxin followed by aflatoxin. Similar increases in WBC were seen in animals treated with DDVP/aldrin and chlordane dieldrin. It appears from our data that dual exposure of rats to these agents induces greater effects than equal doses of single agents. (Author abstract by permission) (Abstract No. 149)

73-1223. Miyazaki, S.; Hodgson, G. C. (Dept. of Entomol. and Dept. of Animal Sci., Univ. of Manitoba, Winnipeg, Canada, R3T 2N2). **Chronic toxicity of Dursban and its metabolite, 3,5,6-trichloro-2-pyridinol in chickens.** *Toxicol. Appl. Pharmacol. 22(3): 391-398; 1972.* (21 references)

Dursban (*O,O*-diethyl-*O*-3,5,6-trichloro-2-pyridyl phosphorothioate) (chlorpyrifos) (1 mg/kg) and its hydrolysis product, 3,5,6-trichloro-2-pyridinol sodium salt (pyridinol salt) (100 mg/kg) were given to White Leghorn cockerels three times a week for 30 wk to assess acute and chronic toxicity, and to investigate possible adverse long term effects. Acute po LD50 values for Dursban and the pyridinol salt for 2 wk old cockerels were 34.8 and $>$ 1000 mg/kg, respectively. The activities of blood cholinesterases decreased until the chickens became 7 wk old and remained constant thereafter. The cholinesterase activities of the Dursban treated chickens, however, were reduced more rapidly and became significantly lower than those of the other groups after 15 wk of treatment, indicating a cumulative physiological effect of sublethal doses. The livers of the pyridinol treated chickens were significantly heavier than those of the other groups after 30 wk of treatment. Liver weight gain in 25 wk was 82% in the pyridinol-treated, 17% in the Dursban treated and 15% in the control group. The Dursban and the pyridinol treated chickens showed no delayed clinical signs of poisoning and their rate of body weight gain was not different from those of the control birds, with the exception that the Dursban treated group gained weight more slowly during the initial 2 wk of the treatment. (Author abstract by permission)

73-1224. Walsh, G. M.; Fink, G. B. (Sch. of Pharmacy, Oregon State Univ., Corvallis, OR 97331). **Comparative toxicity and distribution of endrin and dieldrin after intravenous administration in mice.** *Toxicol. Appl. Pharmacol. 22(3): 408-416; 1972.* (22 references)

Acute iv LD50 values and median survival times (ST50) of endrin and dieldrin were determined in male mice. The duration of components of the seizures induced by an LD90 of endrin (5 mg/kg) or dieldrin (15 mg/kg) were timed. Brain, liver, fat, blood and bile were analyzed by gas chromatography at intervals corresponding to the appearance of seizure components. In addition, brain tissue was analyzed 5 min after equimolar doses and 15 min after equitoxic doses (dose producing ataxia in 90% of the population). The seizure patterns produced by either insecticide were similar, except for the shorter duration of seizure components induced by dieldrin. The LD50 of dieldrin was five times that of endrin and its ST50 was less at equilethal doses. At equimolar doses, however, the ST50 of dieldrin was greater than that of endrin. The concentrations of the insecticides in the brain reached equilibrium before the appearance of the seizure components. Ratios of brain concentration to dose were the same for both compounds after equipotent, equilethal or equimolar doses. No insecticide was detected in the bile. Thus, the rate and extent of distribution into whole brain and other tissues cannot account for differences in LD50 between endrin and dieldrin, but may explain differences in ST50 values obtained from equilethal doses. The results suggest the presence of time dependent events in the mechanism of action of the cyclodienes. (Author abstract by permission)

73-1225. Kuhnen-Clausen, D. (Inst. fuer Aerobiol., Fraunhofer-Gesellschaft, D5949 Grafschaft/Sauerland, Germany). **Structure-activity relationship of mono- and bisquaternary pyridines in regard to their parasympatholytic effects.** *Toxicol. Appl. Pharmacol. 22(3): 443-454; 1972.* (24 references)

The parasympatholytic effects of 4 monoquaternary and of 8 bisquaternary pyridines, i.e. derivatives of PAM, TMB-4 and toxogonin, have been studied on the isolated guinea pig ileum. They were found to antagonize the action of acetyl-β-methylcholine and furthrethonium. One monoquaternary compound was an

exception. Their antagonistic actions have been compared with that of the competitive cholinergic antagonist, lachesine. Unsubstituted pyridinium compounds were weak cholinergic antagonists. The substitution with oxime and/or carbamate groups in the ring yields antagonists with increased activity. Pyridines with the oxime group in position 4 of the ring are the most active derivatives, displaying values of pA_2 higher than 4.0. Values of pA_2 have been estimated from experiments before and after the irreversible blockade of the receptor reserve for the agonist acetyl-β-methylcholine by dibenamine. For some pyridines, the pA_2 values were found to be dependent on the agonist and/or on the fraction of active receptors. Three pyridinium compounds provoke contractions of the ileum. They are thought to be partial cholinergic agonists. (Author abstract by permission)

73-1226. Chien, T. S.; Kinoshita, F. K.; DuBois, K. P. (Toxicity Lab., Dept. of Pharmacol., Univ. of Chicago, Chicago, IL 60637). **Acute toxicity and antiesterase action of *O*-ethyl-*S*,*S*-diphenyl phosphorodithioate (Hinosan).** *Toxicol. Appl. Pharmacol. 22(3): 519-527; 1972.* (13 references)

The acute toxicity of *O*-ethyl-*S*,*S*-diphenyl phosphorodithioate (Hinosan: Bay 78418) was studied in rats. By the ip route LD50 values were 25.5 ± 7.7 for adult female and male rats, respectively. An age difference in the susceptibility of male rats to the toxicity of Hinosan was noted, with young rats being more susceptible than adults. Hinosan was found to be an effective inhibitor of cholinesterase activity in vitro as evidenced by 50% inhibition of rat brain cholinesterase activity at a concentration of $1.05 \times 10^{-6} M$. Measurements of the anticholinesterase action of Hinosan in vivo demonstrated that the cholinesterase activity of the central and peripheral tissues was inhibited to an equal extent, and the inhibitory effect was rapid in onset and of long duration. Data obtained by feeding various levels of Hinosan showed that it is a potent aliesterase inhibitor. The toxicity of malathion to rats was markedly enhanced by prior administration. Pretreatment of rats with phenobarbital, DDT, 3-methylcholanthrene or testosterone markedly reduced the anticholinesterase action of Hinosan, suggesting that it is detoxified by an oxidative microsomal enzyme system. (Author abstract by permission)

73-1227. Perevodchikova, N. I.; Platinskiy, L. V.; Kertsman, V. I. (Inst. Exp. Clin. Oncol., Acad. Med. Sci. USSR, Moscow, USSR). **Lecheniye preparatom *o,p'*-DDD neoperabel'nykh form zlokachestvennykh opukholey nadpochechnika. [The treatment of inoperable forms of malignant tumors of the adrenal cortex with *o,p'*-DDD].** *Vop. Onkol. 18(11): 24-29; 1972.* (7 references) (Russian)

Results of the *o,p'*-DDD (TDE) therapy of 12 previously operated, subsequently inoperable cases of malignant adrenocortical tumors are reported. Nine tumors were hormone-producing with such manifestations as Cushing's syndrome, virilism, and precocious sexual and physical development. Treatment with 1-12 g daily doses of *o,p'*-DDD for 1.5 months to 4 yr resulted in temporary symptomatic improvement and in a substantial reduction of steroid production in both the primary tumors and their metastases. Disappearance or regression of the pulmonary metastases was observed in four cases. The side effects of *o,p'*-DDD treatment (general indisposition, unsteadiness, asthenia, nausea, vomiting, and occasionally hematuria, skin rash, leukopenia, and thrombocytopenia) ceased after the therapy was stopped or the dosage reduced.

73-1228. Ostroukhova, V. A.; Kaminskaya, T. L. (Kiev Sci. Res. Inst. Ind. Hyg. Occup. Dis., Kiev, USSR). **Vliyaniye inyektsiy kokarboksilazy na okislitelnyye protsessy pri intoksikatsii tetrametiltiuramdisulfidom. [Effect of cocarboxylase on oxidative processes in tetramethylthiuramdisulfide intoxication.]** *Vrach. Delo 6: 140-143; 1972.* (Russian)

The effect of daily 200 gamma i.m. doses of cocarboxylase on the oxidative enzyme-inhibiting action of daily oral 148 mg/kg doses of thiram was studied on albino rats during a one month experiment. The rates of inhibition of the cytochrome system, the succinate oxidase, pyruvate oxidase, and alpha-ketoglutarate oxidase activities of the liver in two different groups fed only thiram and thiram plus cocarboxylase were 31 and 17%, 56 and 32%, 56 and 38% as well as 60 and 42%, respectively. Similar effect of cocarboxylase on the cerebral enzymes was observed. Cocarboxylase nearly normalized the blood pyruvic and lactic acid levels increased by thiram. While thiram alone caused no changes in the hepatic and mitochondrial free and phosphorylated thiamine contents, cocarboxylase led to an increase in the total, and especially in the phosphorylated thiamine content of the mitochondria, and it also stabilized the mitochondrial cocarboxylase which greatly varied in the control group. The findings indicate that the inhibition by thiram of thiamine-containing enzymes is not due to the direct action of thiram on the cocarboxylase and that thiram affects not only the thiamine-containing enzymes.

73-1229 Nose, K. (Section of Agr. Chem., Inst. of Agr. Sci. Min. of Agr. and Forestry, Kita, Tokyo, Japan). **[Problems concerning the residual toxicity of herbicides.]** *Zasso To Sono Bojo (Weeds Contr.) 10: 22-25; 1972.* (Japanese)

Herbicides, generally having lower lipid solubility than insecticides and fungicides, offer fewer problems of accumulation in food chains. However, questions have been raised about the teratogenicity or carcinogenicity of some herbicides. Notable examples are the reported carcinogenicity of amitrole and the alleged terato-

genicity of 2,4,5-T formulations. Formation of azo compounds in soil during decomposition of anilide herbicides has been reported although the azo compounds formed were not definitely carcinogenic. Healthy skepticism in herbicide use is advised.

73-1230. Mel'nikov, N. N. (All-Union Res. Inst. Chem. Plant Protection, Moscow, USSR). **Ueber einige Forschungsrichtungen auf dem Gebiet der biozid wirksamen Organophosphorverbindungen. [On some trends in the development of new organophosphorus pesticides.]** *Z. Chem. 12(6): 201-208; 1972.* (128 references) (German)

General problems of the action mechanism and metabolism and recent trends in the synthesis of additional organophosphorus pesticides are reviewed. Organophosphorus pesticides have high rates of metabolism in soil, plants, and animals. They decompose into phosphoric acid and other non-toxic compounds which finally form glucuronates that are eliminated with urine. The metabolism in plants is usually completed within the vegetation period. The relatively low toxicity of phosphoric acid esters in vertebrates is due mostly to their high rates of alkylation while the selectivity is a result of the complex, multiple reactions of organophosphorus compounds with different esterases of various structures. The rates of alkylation increase in the succession phosphates, thiophosphates, dithiophosphates, and tertiary, secondary, and primary amines. Most of the new organophosphorus pesticides, including phosphoric acid esters and phosphoric acid amides, have moderate toxicity. The syntheses of several new organophosphorus compounds are explained.

73-1231. Davidek, J.; Seifert, J. (Dept. of Food Chem. and Anal., Tech. Univ., Prague, Czechoslovakia). **The studies of interaction between ascorbate oxidase and some organophosphorus insecticides in vitro.** *Z. Lebensm. Unters. Forsch. 148(6): 351-353; 1972.* (3 references)

Metathion (fenitrothion), paraoxon, and dichlorvos in concentrations much higher than those expected to occur after agricultural application did not inhibit ascorbate oxidase from green squash or cucumber. Trichlorfon in a non-buffered solution increasingly inhibited the enzyme as the amount became larger, probably because of the shift in pH. The amount of acid (in the form of trichlorfon) required to show this effect is too large to be observed under field conditions.

73-1232. Mihai, M.; Badescu, C.; Iorgulescu, P. A.; Hrisanidi, S. (Fac. de Med. Vet., Bucharest, Rumania). **Modificazioni delle proteine dei tessuti animali sotto l'azione di alcuni pesticidi. [Animal tissue protein alterations caused by some pesticides.]** *Zooprufilassi 27(3-4): 83-90; 1972.* (11 references) (Italian)

Neguvon (trichlorfon) orally administered to guinea pigs and horses at 60 and 80 mg/kg, respectively, produced considerable changes in their blood and liver free amino acid dynamics. Blood methionine doubled in guinea pigs and glutamic acid decreased. Threonine and phenylalanine were the only amino acids of 15 studied which remained unaltered. Neguvon tripled serine levels, doubled leucine and phenylalanine levels, and increased 13 other amino acid concentrations in the guinea pig liver. Eleven of the fifteen tested horse blood sample amino acid levels increased; alanine and aspartic acid doubled; lysine slightly decreased; and histidine, tyrosine, and tryptophan levels were unchanged. All 14 amino acids tested increased in Neguvon-treated horse livers. Aspartic acid and serine were five and three times greater than controls. Chicks subjected to Emulpan spraying (a Rumanian preparation including lindane, an insecticidal naphthalene solvent and non-toxic tensioactive additives) had increased liver amino acid levels 24 hr after treatment. These levels decreased slightly by 48 hr and were lower than in controls three weeks after treatment. Both products seem to affect the activity of proteases.

See also 73-1018 73-1046 73-1050 73-1071 73-1106 73-1111 73-1114

73-1233. Takase, I.; Nakahara, T.; Yoshimoto, Y.; Nakamura, H. (Agr. Chem. Inst., Nihon Tokushu Noyaku Seizo Co., Ltd., Tokyo, Japan). **[Determination of residues of trichlorfon and its metabolites in plants, milk, chicken, and fish by gas chromatography.]** *Bochu Kagaku (Sci. Pest Contr.) 37(4): 142-148; 1972.* (10 references) (Japanese)

A sensitive method was developed for determining residues of trichlorfon and its possible metabolites such as dichlorvos, dimethyl phosphate, desmethyl trichlorfon, and trichloroethanol in plants, milk, chicken, and fish. The method consists of solvent extraction, followed by gas chromatography with an alkali flame thermionic detector or an electon capture detector. Acetonitrile is suitable for extracting trichlorfon and its metabolites from plant materials, chicken, and fish, and a mixture of acetonitrile and methanol (2:1) is suitable for extraction from milk. Recoveries of trichlorfon added at 0.1 ppm and dichlorvos, dimethyl phosphate, and trichloroethanol added at 0.2-0.5 ppm were 90-101%, 83-103%, 70-74%, and 78-81%, respectively. The lower limit of detection by this method was 0.005 ppm trichlorfon in plants, chicken, and fish, and 0.002 ppm in milk. Residues were determined by this method in corn plants from a field treated with 5% trichlorfon granules at 5 g/m^2. The whole plant trichlorfon residue remained at 0.19 ppm for six days, then gradually decreased to 0.07 ppm by the twelfth day after treatment. Residues in corn leaves were 0.5 ppm one day and 0.2 ppm six days after treatment, whereas in the stalks, the residue was 0.07 ppm the day after treatment. No trichlorfon metabolites were detected.

73-1234. Baba, N.; Kirihata, M.; Ohno, M.; Takano, T.; Kawano, K. (Inst. for Chem. Res., Kyoto Univ., Kyoto, Japan). **Studies on the orthophosphoric acid method for the pyrethrum assay.** *Bochu Kagaku (Sci. Pest Contr.) 37(4): 155-161; 1972.* (12 references)

The color reaction of orthophosphoric acid with natural pyrethrum extract was studied to elucidate the participating components of the reaction and conditions for color development. Pyrethrolone and pyrethrins I and II gave the characteristic rose red color with a maximum absorbance at 550 nm. Other constituents did not produce measurable color. Optimum conditions for color development were: 1 min shaking time; 2.5 min heating at 100° after shaking; and measurement within 5 to 10 min after cooling the mixture to room temperature. Dried flowers stored for a long time gave much lower assay values by this method than flowers stored for less than a few months; GC determinations gave similar results.

73-1235. Thier, H. P. (Inst. fuer Angew. Chem., Univ. Erlangen-Nuernberg, Erlangen, Germany). **Analysengang zur Ermittlung von Pestizid-Rueckstaenden in Pflanzenmaterial. (Schluss). [Analytical procedure for the determination of pesticide residues in plant materials. Conclusion.]** *Deut. Lebensm. Rundsch. 68(12): 397-401; 1972.* (33 references) (German)

An analytical procedure is described for the detection and determination of polar and nonpolar pesticide residues in plant material which is especially suitable for routine analysis. Extraction with acetonitrile is followed by partition between aqueous sodium chloride solution and petroleum ether/methylene chloride in an 8-to-12 ratio, and by fractionation on a Florisil column using solvent mixtures with increasing polarity. The fractions are analyzed by electron capture gas chromatography and by thin-layer chromatography. It was possible to adapt 18 insecticides and herbicides (phenmedipham, monuron, swep, propham, monalide, propanil, chlorpropham, pentachlor, piperonyl butoxide, monolinuron, metobromuron, diuron, linuron, pentanochlor, carbaryl, mercaptodimethur, promecarb, and propoxur) for electron capture gas chromatographic analysis through simple bromination to the respective bromo derivatives.

73-1236. Ebing, W. (Inst. fuer Pflanzenschutzmittelforsch., Biol. Bundesanstalt fuer Land- und Forstwirtschaft, Berlin-Dahlem, Germany). **Probleme der Rueckstandsanalytik von Bioziden aus der Sicht des Umweltschutzes. [Problems in the analysis of biocide residues from the viewpoint of environmental protection.]** *Deut. Lebensm. Rundsch. 69(1): 39-45; 1973.* (97 references) (German)

Some problems in residue analysis of biocides caused by the ever increasing number of available active ingredients and the enlarged pool of samples are discussed. Metabolites of 88 pesticides are recommended for coverage by residue analysis. Mechanization, standardization, and automation of chromatographic determination are both desirable and possible. Repetitive residue analysis using a thermionic detector and sweep codistillation constitute some of the latest achievements in the development of automated analytical procedures. It was possible to determine, with adequate accuracy, thionazin, disulfoton, and ethion concentrations of about 29 to 35 picograms using a thermionic detector in repetitive analysis.

73-1237. Takeshita, R.; Yamashita, T. (Inst. of Pub. Health, Tokyo, Japan). **[Reversed-phase partition thin-layer chromatography of chlorinated pesticides and polychlorinated biphenyls.]** *Eisei Kagaku (J. Hyg. Chem.) 18(6): 388-392; 1972.* (7 references) (Japanese)

Five organochlorine pesticides, DDT, DDE, aldrin, dieldrin, and endrin, showed well defined spots on absorption chromatograms using silica gel/hexane and also on reverse-phase partition thin-layer chromatograms with liquid paraffin-silica gel/aqueous methanol. In the absorption chromatogram, *Rf* values were 0.02, 0.03, 0.11, 0.32, and 0.35 respectively for dieldrin, endrin,

DDT, DDE, and aldrin with a detection limit of 0.1 μg. In the reverse-phase partition chromatogram the *Rf* values were respectively 0.60, 0.56, 0.46, 0.34, and 0.31, with detection limits of 0.5 μg for dieldrin, endrin, and DDT, and 0.2 μg for DDE and aldrin. On the other hand, polychlorinated biphenyls gave overlapping spots along the flow, so in these two systems the detection of organochlorine pesticides is difficult in the presence of polychlorinated biphenyls.

73-1238. Reinke, J.; Uthe, J. F.; O'Brodovich, H. (Dept. of the Environ., Fish. Serv., Freshwater Inst., Winnipeg, Canada). **Determination of polychlorinated biphenyls in the presence of organochlorine pesticides by thin-layer chromatography.** *Environ. Lett. 4(3): 201-210; 1973.* (10 references)

A thin layer technique for separation of polychlorinated biphenyls (PCB) and common organochlorine pesticides was developed which is quantitative, simple, and inexpensive. Samples were spotted on alumina plates and spots developed in triethylamine - hexane. Exposure to UV light and then steam was used to make the spots visible. Material at each spot was extracted in acetone-hexane and assayed by GC. Greater than 90% recoveries were found with the Arochlors, lindane, heptachlor, aldrin, heptachlor epoxide, endrin, dieldrin, *o,p'*-DDT, *p,p'*-DDD (TDE), *p,p'*-DDT, chlordane, and thiodan (endosulfan). Over 80% recovery was obtained with methoxychlor and *p,p'*-DDE.

73-1239. Kosmatyy, Ye. S.; Bublik, L. I.; Gavrilova, G. V. (Ukrainian Sci. Res. Inst. Plant Protection, Kiev, USSR). **Primeneniye tonkosloynoy khromatografii dlya opredeleniya tsineba v rasteniyakh tabaka. [Application of thin-layer chromatography for determination of zineb in tobacco plants.]** *Fiziol. Biokhim. Kult. Rast. 4(3): 317-321; 1972.* (9 references) (Russian)

A thin-layer chromatographic method is described for the determination of zineb residues in tobacco and other plants and in crops. The determination is based on the acid-mediated decomposition of zineb, forming carbon disulfide which then reacts with potassium hydroxide to form potassium xanthate. Potassium xanthate is determined on a thin layer of silica gel and alumina in a ratio of 1:1. Acetone and methanol in a 20:1 ratio is used as solvent, and a 2% hydrochloric acid solution of ammonium molybdate is applied as the chromogenic reagent. The xanthate concentration is determined by comparison of the xanthate spot with spots of standard solutions. The sensitivity of the method is 10μg/100 g tobacco. A complete determination takes about two hours.

73-1240. Rosales, J. (Ciba-Geigy AG, Monthey, Switzerland). **Titrimetrische Bestimmungsmethode fuer die Vinylphosphatinsecticide Dicrotophos (dimethyl-(2-dimethylcarbamoyl-1-methyl-vinyl)phosphat) und Monocrotophos (dimethyl-(2-methylcarbamoyl-1-methyl-vinyl)phosphat). [Titrimetric determination method for the vinyl phosphate insecticides dicrotophos and monocrotophos.]** *Fresenius Z. Anal. Chem. 262(5): 361-363; 1972.* (3 references) (German)

The alkaline hydrolysis of the vinylphosphates dicrotophos and monocrotophos gives dimethylphosphoric acid and the corresponding *N*-methylated acetoacetamide which is titrated with sodium nitrite. Polarovoltry (constant current potentiometry) is well suited for end point detection. Free acetoacetamides are determined by the same method in non-hydrolyzed samples, and subtracted from the results if necessary. (Author abstract by permission, edited)

73-1241. Pflugmacher, J.; Ebing, W. (Biol. Bundesanstalt fuer Land- und Forstwirstchaft, Berlin-Dahlem, Germany). **Reinigung Pesticidrueckstaende enthaltender Rohextrakte mit einer automatisch arbeitenden Apparatur nach dem Prinzip der kombinierten Spuel- und Codestillation (Sweep Co-Distillation). [Cleanup of crude extracts containing pesticide residues by an automatic apparatus based on the principle of sweep codistillation.]** *Fresenius Z. Anal. Chem. 263(2): 120-127; 1973.* (20 references) (German)

An automatic apparatus, based on the principle of sweep codistillation, has been constructed which cleans up crude extracts for gas chromatographic residue analysis of insecticides. Using this instrument, for example, crude extracts from 13 crops containing 27 organophosphate pesticides have been cleaned up, applying specific conditions for each. Average recovery values were 66.4-113.4%. Added residue levels were selected in accordance with the German tolerance list. Additional applications for the apparatus are suggested. (Author abstract by permission, edited).

73-1242. Frank, R.; Decker, O. D.; Day, Jr., E. W. (Eli Lilly and Co., Greenfield Labs., Greenfield, IN 46140). **Gas chromatographic determination of triarimol in formulations and technical material.** *J. Ass. Offic. Anal. Chem. 56(1): 11-13; 1973.*

The triarimol content in formulations and technical materials is determined by flame ionization gas-liquid chromatography after the sample is dissolved in or extracted with chloroform. Pesticides commonly occurring with triarimol do not interfere in this method. Replicate injections of emulsifiable concentrate and wettable powder samples showed good precision. (Author abstract by permission)

73-1243. Maybury, R. B.; Cochrane, W. P. (Anal. Serv. Sta., Plant Products Div., Can. Dept. of Agr., Ottawa, Ontario, Canada K1AOC5). **Evaluation of chemical con-**

firmatory tests for analysis of dieldrin residues. *J. Ass. Offic. Anal. Chem. 56(1): 36-40; 1973.* (17 references)

Eight of the more commonly used reagents for the confirmation of dieldrin at the residue level were compared for several substrates. In some instances derivatives were isolated and identified. The reactions were evaluated using pure dieldrin and spiked sample extracts of grass, animal feeds, and butterfat. Two reagents, aqueous HBr solution and BCl_3/2-chloroethanol, were especially useful because of their application and sensitivity, i.e., 0.003 ppm for a 10 g dry sample and 0.001 ppm for a 25 g wet sample. The $ZnCl_2$/HCl reagent was a practical alternative to the BCl_3/2-chloroethanol reagent. The HBr/Ac_2O reagent gave a more positive confirmation at a lower sensitivity. (Author abstract by permission)

73-1244. Sirons, G. J. (Provinicial Pestic. Residue Testing Lab., Min. of Agr. and Food, Guelph, Ontario, Canada N1G 2W1). **Gas-liquid chromatographic determination of methyl isothiocyanate in soils.** *J. Ass. Offic. Anal. Chem. 56(1): 41-44; 1973.* (5 references)

Residues of methyl isothiocyanate in soils are extracted with diethyl ether containing 5% ethanol, concentrated in a Kuderna-Danish concentrator, and subjected to gas-liquid chromatography without further cleanup. A 6% Carbowax 20M column is used in conjunction with either conductivity (nitrogen mode) or flame photometric (sulfur mode) detection systems. The method is rapid and capable of determining methyl isothiocyanate residues in soils at a level as low as 0.01 ppm. (Author abstract by permission)

73-1245. Saha, M.; Sumner, A. K.; Saha, J. G.* (Can. Agr. Res. Sta., Univ. Campus, Saskatoon, Saskatchewan, Canada). **Comparison of three extraction and cleanup methods for determining carbon-14-labeled residues from wheat plants grown in soil treated with dyfonate-ring-^{14}C.** *J. Ass. Offic. Anal. Chem. 56(1): 45-48; 1973.* (14 references)

Three methods for determining organophosphorus insecticide residues in plant tissues were compared for efficiency of extraction and cleanup of ^{14}C-labeled residues from wheat plants grown in soil treated with Dyfonate-ring-^{14}C. Blending with ethyl acetate recovered 70.5% of the radioactivity present in the plant tissues and cleanup of the extract by sweep codistillation recovered 99% of the radioactivity. Blending of plants with benzene recovered about 58% of the radioactivity and subsequent cleanup of the extract on a silica gel column recovered about 78% of the activity. Although blending with acetonitrile recovered 59% of the radioactivity present in the plant tissue, partitioning of the extract between water and petroleum ether or chloroform retained only about 14 and 30% of the activity in the organic layer, respectively. Thus, the overall efficiency of this procedure was only between 8 and 18% as compared to 45 and 70% in the other two methods. (Author abstract by permission)

73-1246. Struble, D. L. (Res. Sta., Can. Dept. of Agr., Lethbridge, Alberta, Can., T 1J 4B1). **Conditioning of polyalkyl glycol liquid phases for flame photometric gas chromatographic analysis of Dursban and its oxygen analog.** *J. Ass. Offic. Anal. Chem. 56(1): 49-52; 1973.* (11 references)

Dursban (chlorpyrifos) and its oxygen analog were resolved by three liquid phases, Ucon 75-H-90,000 and Carbowaxes 20M and 20M TPA, on unsilanized, acid-washed Chromosorb W. The GLC responses and resolutions of the two compounds were dependent upon the conditioning of the packing before it was placed in the GLC columns. The most satisfactory results were obtained when the column packing was heated in the presence of atmospheric oxygen. The best liquid phase for the GLC analysis of Dursban and its oxygen analog was Ucon 75-H-90,000. (Author abstract by permission)

73-1247. Poziomek, E. J.; Crabtree, E. V.* (Chem. Lab., Edgewood Arsenal, MD 21010). **Review of the Schoenemann reaction in analysis and detection of organophosphorus compounds.** *J. Ass. Offic. Anal. Chem. 56(1): 56-62; 1973.* (19 references)

This report reviews the chemistry of the Schoenemann reaction and describes the principles and applications in the detection of organophosphorus compounds. Emphasis is placed on the analysis of the very toxic compounds ethyl *N,N*-dimethylphosphoramido cyanidate and isopropyl methylphosphono- fluoridate. There are many literature publications and government reports which illustrate applicability of the Schoenemann reaction. Key literature references are mentioned throughout this report; also, there are many citations of unpublished data. (Author abstract by permission)

73-1248. Rote, J. W.; Morris, W. J.* (Finnigan Corp., Sunnyvale, CA 94086). **Use of isotopic abundance ratios in identification of polychlorinated biphenyls by mass spectrometry.** *J. Ass. Offic. Anal. Chem. 56(1): 188-199; 1973.* (34 references)

Polychlorinated biphenyls are industrial compounds which are being detected throughout the global ecosystem. Because of the presence of other residues, combined gas chromatography-mass spectrometry must be used for their confirmation. Using isotopic abundance ratios, the theoretical probability of the occurrence of ions of different masses in the molecular cluster has been calculated for the polychlorinated biphenyls, polychlorinated terphenyls, and chlorinated naphthalenes. Mass spectra of mono- through decachlorobiphenyl have been taken with a unit resolution, computer-controlled GC-MS system and parent ion clusters were matched with the

theoretical isotopic patterns. This method provides the unambiguous identification of polychlorinated biphenyls in the presence of other substances. (Author abstract by permission)

73-1249. Tjan, G. H.; Burgers, L. J. (Keuringsdienst van Waren, Van Nispenstraat 41, Nijmegen, The Netherlands). **Thin layer chromatographic detection of thiabendazole and benomyl in fruits.** *J. Ass. Offic. Anal. Chem. 56(1): 223-225; 1973.* (5 references)

Thiabendazole and benomyl are extracted from fruit peels with ethyl acetate and the extracts are filtered. The filtrates are extracted with 0.1*N* HCl, adjusted to pH 6 with 0.1*N* NaOH, and re-extracted with ethyl acetate. The concentrated extracts are spotted on plates coated with silica gel GF-254. The fungicides are detected on the plates under shortwave ultraviolet light, after development with chloroform-acetone (8+2), as pink-blue spots on a light fluorescent background. The recovery of thiabendazole from fortified samples is satisfactory, but the recovery of benomyl is not quantitative. For greater specificity, an enzymatic inhibition technique is also described which may be used on the exposed silica gel GF-254 plate or on a silica gel G plate. (Author abstract by permission)

73-1250. Eastin, E. F. (Dept. of Soil and Crop Sci., Texas A & M Univ., College Station, TX 77843). **Separation of SAN-6706 and some related compounds by thin-layer chromatography.** *J. Chromatogr. 66(2): 386-387; 1972.*

The chromatographic behavior of a new herbicide, 4-chloro-5-(dimethylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2*H*)-pyridazinone, and its possible degradation products was investigated. Optimum separation was attained by thin-layer chromatography on commercial sheets precoated with a 100 μm layer of silica gel and containing a fluorescent indicator. The chromatograms were dried in a forced-air hood at room temperature and examined under UV light at 254 nm. Chloroform was selected as the optimum solvent, and developing twice in the same direction provided optimal resolution. The limit of detection for SAN-6707 and its two major metabolites was 1.0 μg or less. The compounds appeared as blue spots on a white background.

73-1251. Cochrane, W. P.; Wilson, B. P.; Greenhalgh, R. (Anal. Serv. Sect., Plant Products Div., Canada Dept. of Agr., Ottawa, Canada K1A OC5). **Determination of sulphur- and chlorine-containing pesticides with an electrolytic conductivity detector.** *J. Chromatogr. 75(2): 207-218; 1973.* (16 references)

The responses of a number of sulphur-containing compounds, some of which also contained chlorine and nitrogen, were investigated using both the pyrolytic and oxidative modes of operation of the Coulson electrolytic conductivity detector. The effects of variation in furnace temperature and oxygen flow were studied. Half-scale responses for thirty-six sulphur compounds obtained in the pyrolytic mode at 850°, were in the 6-100 ng range which compared favorably with flame photometric detection in the sulphur mode. Also in the pyrolytic mode, a similar range of responses was obtained from a study of thirteen organochlorine insecticides. Responses were found to be linear in the range 2 to 1000 ng of sulphur with as low as 0.5 ng of sulphur and/or chlorine being detected. In the pyrolytic mode nitrogen-containing compounds produced interference. The use of silver scrubbers for chloride removal in the oxidative mode although imparting selectivity also resulted in decreased sulphur response and lack of reproducibility. (Author abstract by permission)

73-1252. Siuda, J. F.; DeBernardis, J. F.; Cavestri, R. C. (Dept. of Med. Chem., Univ. of Pittsburgh, Pittsburgh, PA 15213). **A simple and inexpensive method for the visual detection of sub-microgram amounts of halogenated substances present in gas chromatographic effluents.** *J. Chromatogr. 75(2): 298-303; 1973.* (17 references)

A method based on a visual Beilstein test was developed for routine screening of complex mixtures for the presence of covalently bound halogen-containing substances, including organochlorine pesticides and polychlorinated biphenyls. A standard gas chromatographic flame ionization detector was modified by addition of a 24-gauge copper wire coil placed around the flame tip. Advantageously, a sample aliquot is run in the normal fashion with the detector cap in place. Then another sample portion is injected with the detector cap removed. Several hundreds of nanograms of halogenated organic compounds will produce a sharp, bright green glow. When a green flame is observed, the corresponding peak in the initial chromatogram is marked. For optimal performance, the copper coil is replaced every 4-6 hr. The observation involves only a 5 to 7 min delay in the analysis. Most potentially interfering nitrogen compounds can be removed by phosphoric acid washing of the crude extract. Nitriles, which may interfere, are uncommon in natural systems and generate a much smaller response. Preliminary trials of this detector on extracts from red marine algae indicated the presence of polychlorinated biphenyls, but no pesticides.

73-1253. Kumar, R.; Burkhardt, C. C. (Dept. of Entomol., Univ. of Wyoming, Laramie, WY 82070). **Bioassay determination of insecticide residues in alfalfa.** *J. Econ. Entomol. 65(6): 1593-1595; 1972.* (9 references)

Alfalfa samples treated with Cytrolane (cyclic propylene *P,P*-diethyl phosphonodithioimidocarbonate) and Cyolane (cyclic ethylene *P,P*-diethyl phosphonodithiomidocarbonate) were collected from two climatically different localities in Wyoming, Torrington,

and Laramie. Samples were taken at 0-, 7-, 14-, and 21-day intervals following treatment during 1969 and 1970. Bioassay studies were conducted using larvae of *Culiseta inornata* (Williston). The percent recovery was 88±3.5 for Cyolane. As low as 0.01 ppm of these insecticides could be detected by this assay method. Residues (ppm) present in alfalfa samples indicated comparatively higher concentrations of residues in Laramie samples than in the Torrington samples. Hence, the data revealed a more rapid rate of degradation at Torrington than at Laramie. (Author abstract by permission)

73-1254. Talanov, G. A.; Leshchev, V. V. (All-Union Sci. Res. Inst. Vet. Hyg., Moscow, USSR). **Opredeleniye diazinona i dursbana v moloke, organakh i tkanyakh zhivotnykh pri pomoshchi gazovoy khromatografii. [Gas-chromatographic determination of diazinon and Dursban in milk, organs, and tissues of animals.]** *Khim. Sel. Khoz. 10(11): 42-44; 1972.* (Russian)

A thermionic detector-gas chromatographic method for the determination of diazinon and Dursban (chlorpyrifos) residues in animal milk, organs, and tissues is described. Tissues are extracted with acetone. The extract, dried with anhydrous sodium sulfate, is mixed with *n*-hexane for chromatographic determination. A column temperature of 180°C and an evaporator temperature of 260°C are used. The retention times of diazinon and Dursban are 2.2 and 4.4 min, respectively. Dursban can also be determined with an electron capture detector instead of a thermionic detector. The lower limits of detectability for diazinon and Dursban are 0.05 ng and 0.1 ng, while the respective sensitivities are 0.02 and 0.04 mg/kg in an extract volume of 5 µl. The recovery rate varies from 65 to 82%.

73-1255. Cee, A.; Gasparic, J. (Mikroanalytisches Laboratorium, Forschungsinstitut fuer organische Synthesen, Pardubice-Rybitvi, Czechoslovakia). **Nachweis der *s*-Triazin-Gruppe in organischen Verbindungen. LXXVIII. Mitt. ueber die Identifizierung organischer Verbindungen. [Analysis of *s*-triazine group in organic compounds. Report No. 78 on the identification of organic compounds.]** *Microchim. Acta (Vienna) 6: 823-827; 1972.* (10 references) (German)

A new method is recommended for detection of the *s*-triazine group in organic compounds. The compound to be analyzed is hydrolyzed with 1 *N*-hydrochloric acid at 150°C for two hours in a sealed glass tube and the resulting cyanuric acid identified by paper chromatography using the solvent system 1-propanol-ammonia in a ratio of 2:1 and mercury acetate-diphenylcarbazone reagent for visualizing the spots. This method is suitable for the identification of cyanuric acids from such pesticides as atrazine and propazine.

73-1256. Fechner, G.; Kretzschmann, F.; Ackermann, H.; Toepfer, H. (Inst. fuer Veterinaerwesen des Bezirkes Potsdam, Potsdam, DDR). **Ein verbessertes Verfahren zur duennschichtchromatographisch-enzymatischen Bestimmung von Trichlorphon- und Dichlorvosrueckstaenden in Milch. [Improved method of thin-layer chromatography and enzymatic determination of trichlorfon and dichlorvos residues in milk.]** *Monatsh. Veterinaermed. 26: 860-862; 1971.* (12 references) (German)

An improved thin layer chromatographic enzymatic method for the qualitative and semiquantitative determination of trichlorfon and dichlorvos residues in milk, based on Ackermann's procedure, is described. Milk protein is precipitated with ethanol; the supernatant is concentrated, extracted with chloroform, and again concentrated for thin-layer chromatographic determination. Mixtures of benzene with acetone are used as solvents. A beef liver homogenate, used as the enzyme source, is applied and the plate incubated at 38°C for 30-60 min, then sprayed with β-naphthyl acetate in ethanol and diazo blue. The inhibition of the arylesterase by organophosphorus pesticides prevents hydrolysis of β-naphthyl acetate. The pesticide is visualized as white spots against a colored background. Trichlorfon, with minimal arylesterase-inhibiting effect, is first converted into dichlorvos by treatment with ammonia. The thin-layer chromatographic method is suitable as a routine residue test. The respective detection thresholds for trichlorfon and dichlorvos are 0.005 mg/l. and 0.002 mg/l.

73-1257. Suzuki, M.; Yamato, Y.; Watanabe, T. (Kitakyushu Munic. Inst. of Pub. Health, Dept. of Food Sci. and Technol., Fac. of Agr., Kyushu Univ., Japan). **[On selection of GLC liquid phases in separation of organochlorine pesticides.]** *Nippon Nogei Kagaku Kaishi (J. Agr. Chem. Soc. Jap.) 47(1): 27-32; 1973.* (28 references) (Japanese)

The separation of 13 organochlorine pesticides and their metabolites commonly found in soil by GLC was investigated using 16 different liquid phases. QF-1, OV-210, and DEGSPA column packings separated isomers of BHC. Separation of heptachlor and its epoxide was achieved on AGL and DC-11 columns. AGL column packing was also used for the separation of aldrin and dieldrin, and OV-17 effected separation of endrin. A combination of 3% silicone OV-17 with 5% Apiezon grease L was suitable for separating BHC isomers and cyclodiene pesticides. The resolution of *p,p'*-DDT and its metabolites was achieved using DEGSPA, and *o,p'*-DDT was separated using OV-225. *p,p'*-DDT, its metabolites, and its isomer were separated on a combination of 2% diethylene glycol succinate-0.5% phosphoric acid with 2% silicone OV-225.

73-1258. Kashiwa, T.; Onda, K.; Nishizima, O.; Suzuki, K. (Agr. Chem. Insp. Sta., Min. of Agr. and Forestry, Tokyo, Japan). **[Study for analysis of pesticides by thin-layer chromatography. Part 1. Dry thin-layer chromato-**

graphy of pesticides.] *Noyaku Seisan Gijutsu (Pestic. Tech.) 23: 15-24; 1971.* (7 references) (Japanese)

Rf and *Rs* values are tabulated for 97 pesticides and pesticide-related compounds in 24 developing solvent systems. A standardized dry thin-layer chromatographic method was detailed. Color reagents used were butter yellow, Sudan red G, and indophenol. Suggestions are made for use of the data provided. These include development of methods for separation of active ingredients from other components of pesticide preparations, separation of ingredients in mixed preparations, and characterization of unknown pesticides.

73-1259. Murai, T.; Uesugi, Y.; Tomizawa, C.; Tanaka, T. (Nat. Inst. of Agr. Sci., Tokyo, Japan). **[An identification method of partial hydrolysis products of organophosphorus fungicides by flame thermionic gas chromatography.]** *Noyaku Seisan Gijutsu (Pestic. Tec .) 24: 23-26; 1971.* (4 references) (Japanese)

A method is described for rapid identification of partial hydrolysis products of organophosphorus fungicides. The hydrolysis products are methylated with diazomethane, followed by gas chromatographic separation with a flame thermionic detector. The method was applied to the identification of hydrolysis products of ESBP (Inezin, *O*-ethyl-*S*-benzylphenylphosphonothiolate) in acidic solution. The major hydrolysis products identified were phenylphosphonic acid, phenylphosphonothioic acid, ethyl hydrogen phenylphosphonate, and *O*-ethyl hydrogen phenylphosphonothioate.

73-1260. Kashiwa, T. (Agr. Chem. Insp. Sta., Min. of Agr. and Forestry, Tokyo, Japan). **[Study for analysis of pesticides by thin-layer chromatography. Part 2. The relationship between *Rf* values and physical and chemical properties of pesticides.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 24: 32-42; 1971.* (3 references) (Japanese)

Continuing the tabulation in the preceding report, *Rf* values in 24 solvent systems are given for an additional 102 compounds obtained using a dry thin-layer chromatography method. Correlations between the *Rf* values and the chemical structures of various classes of pesticides, such as organophosphates, nitro compounds, and triazines, are discussed. Compounds of similar chemical structure have nearly similar *Rf* values, and the *Rf* values are related to the polarities of the compounds. The absorption values and Hammett's σ values of the compounds are inversely proportional to *Rf* values within a given group.

73-1261. Pesticides Inspection Office (Min. of Agr. and Forestry, Tokyo, Japan). **[Official methods of pesticide determination. Part 23. 2–Isopropoxyphenyl *N*-methylcarbamate, emulsifiable concentrate and wettable powder.]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 29: 39-40; 1972.* (1 reference) (Japanese)

A method has been developed and published (Notice No. 776, Japan Ministry of Agriculture and Forestry, May 20, 1972) for determining 2-isopropoxyphenyl *N*-methylcarbamate (propoxur) in its EC and WP formulations. Propoxur is extracted from the formulation with acetone. The acetone solution is spotted onto a silica gel plate containing a fluorescent indicator and activated for 2 hr at 110°C, and the zone is developed upward for 12 cm with a mixture of hexane-ethyl acetate-formic acid (60:40:1 v/v). After air-drying, the plate is irradiated under UV light and the dark purple spot is scraped off and collected in methanol. The methanolic solution is hydrolyzed with KOH for 30 min at 40°C, cooled, and a methanolic solution of *p*-nitrobenzenediazonium fluoroborate added. The extinction is read at 530 nm. The recovery from known specimens of emulsifiable concentrate was 99.8 ± 1.6% and from wettable powder, 100.0 ± 1.5%.

73-1262. Qadri, S. S. H. (Dept. of Zool., P. G. Centre, Warangal-1, India). **Estimation of lindane and DDT residues on wheat under storage by bioassay using drosophila.** *Pesticides 5(7): 19-20; 1971.* (14 references)

Adult fruit flies were useful in estimating lindane and DDT deposits on treated wheat. Two grams of wheat which had been shaken with dust formulations to acquire 20 and 100 ppm lindane or 50, 100, and 200 ppm DDT was placed in a test chamber for 24 hr with 20 to 100 wild red-eyed susceptible *D. melanogaster*. The effectiveness of the deposits was assessed in terms of mortality rate (knockdown rate). After four weeks 10% of the initial lindane and 11 to 40% of the initial DDT were estimated on the wheat by this procedure.

73-1263. Holmes, M. G. (Biol. and Chem. Res. Inst., Dept. of Agr., Rydalmere, Sydney, Australia). **The determination of thiabendazole (2-(4-thiazolyl)-benzimidazole) in citrus fruit dips.** *Pestic. Sci. 3(4): 367-370; 1972.* (3 references)

Methods for analyzing the strength of thiabendazole (TBZ) dipping fluids are described. Two methods require only the minimum laboratory facilities and can be used in citrus packing houses. These are a titration method utilizing the complex formed by TBZ with silver ions for accurate work and a refractive index method for rapid checking by packing house employees. These methods are compared with a spectrophotometric method. (Author abstract by permission)

73-1264. Munro, H. E. (Agr. Chem. Lab., Dept. of Primary Ind., Brisbane, Queensland, Australia). **Determination of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid in tomato plants and other commercial crops by microcoulometric gas chromato-**

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